HANDBOOK OF GYNECOLOGY

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FOR STUDENTS AND PRACTITIONERS

BY

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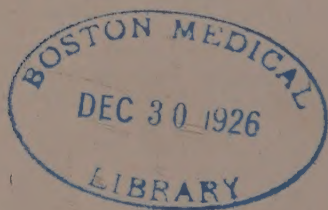*WITH ONE HUNDRED AND SEVENTY-SEVEN
ILLUSTRATIONS*

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PREFACE

From considerable experience in the class room and the clinic, we have seen the need for a handbook of gynecology whose text shall logically arrange and classify the material of the various subjects according to our modern views of etiology and pathology without undue repetition, and which can be primarily adapted to the needs of third and fourth year medical students, as well as the young practitioner who has not yet settled into a special field.

It is often the reproach of a teacher or a writer on medical subjects that he does not realize the relative importance of his specialty to the rest of medical knowledge. We have tried to appreciate that gynecology is a lesser subject than medicine, surgery, or obstetrics, and have tried to prepare a book which will recognize, in its demands upon the time and energies of the student and reader, the proper rank of the specialty.

We have omitted long descriptions of major operations and their technic. We have endeavored to formulate principles of surgery adaptable to the special work, but have made no attempt to prepare a book with every minor detail elaborated and illustrated. Gynecological operations are never the same, because the same conditions and indications do not arise in every case. Even in operative surgery, one should treat the sick patient by whatever means his judgment may consider best adapted to the individual case and circumstance. He should not label the disease first, and then prescribe a certain set procedure for its treatment.

At best one can not properly learn technic, even that of the most brilliant operator, by reading his descriptions and studying his illustrations. The primary requisite is a good foundation of pathology, anatomy, and physiology; next, practice in assisting good operators at the bedside and at the table. We believe that the hospital—not the lecture hall—is the place to learn surgery. The lecture and the textbook can only supply the knowledge of principles, and can not profitably go too minutely into detail.

Our classification differs from the usual one in textbooks on the subject. It has been evolved during twenty years of teaching. We have followed, as much as present knowledge will per-

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mit, the lines of pathology. For instance, we treat of infection of various types as it affects the different tissues and organs of woman; of neoplasms, of traumas, of malformations, etc. We bear strongest upon the parts most commonly or typically affected by these influences. We have not followed the usual anatomical classification, going up step by step from vulva to tube, describing in detail each part until the peritoneum is reached. Gonorrhea is the same in the urethra, the cervix, or the tube, modified only in its manifestations by the special anatomical and physiological characters of the infected regions.

Many of the drawings are from moulages prepared by us for the museum of the Obstetric and Gynecologic Department of Loyola University. These preparations are cast in wax from plaster impressions of actual cases. Many of the illustrations are also from specimens in the museum.

In a work of this kind it is impossible to give complete acknowledgment of the sources of our knowledge or the authority for all our statements. We have listened, we have read, we have worked, we have observed, we have taught, and now we have written and drawn. The judgment is for the reader. We wish to express our appreciation of the value of association with such workers as Ries, Barrett, Hektoen, Herzog, Peterson, MacKechnie, Tarnowski, Martin, Lee and Hillis.

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Henry Foster Lewis,
Alfred de Roulet.

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Chicago, Ill.

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HANDBOOK OF GYNECOLOGY

CHAPTER I

ANATOMY AND PHYSIOLOGY OF THE FEMALE GENITALS

It is assumed that readers have already become familiar, from their studies of general anatomy, with that of the female genital organs. It will be necessary merely to recall memories of knowledge formerly acquired and to emphasize some special relations of anatomy and physiology to this special subject.

EXTERNAL GENITALS

The external genitals are those portions of the female genital system which lie subject to external inspection. They are those organs which are situated externally to the hymen, the boundary line between external and internal genitals.

The external genitals with the vagina are sometimes called the **pars copulationis**; the uterus and tubes, the **pars gestationis,** and the ovary the **pars generationis**.

Mons Veneris

The mons veneris is an elevation in the median line just in front of the symphysis pubis, composed of areolar tissue with much fat and covered with skin abundantly supplied with hair. This hair is part of the so-called female escutcheon which covers the pubic region and extends a little way upon the abdomen. Unlike the male escutcheon, which runs up towards the umbilicus into a point, that of the female ends superiorly in an abrupt margin across the lower abdomen.

The apparent function of the padded mons veneris and the hair which protects it is to shield the parts from friction of the male pubes against them during coitus.

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Labia Majora

The labia majora, analogous to the scrotum, are two folds of tissue similar to that of the mons veneris and continuous with the latter, running from it between the thighs on either side of the vulvar slit to merge with the ordinary integument in front of the anus.   In the ordinary positions of the nulliparous woman the mons and the labia

Fig. 1.—Relation of pelvic organs to anterior surface of abdomen.   (Dickinson—*American Textbook of Obstetrics.*)

majora are the only parts of the external genitals visible without separation of the parts.

The labia majora are covered with hairs on the external aspect and are, like the mons veneris, abundantly supplied with sweat and sebaceous glands. On the inner aspect they are hairless and are covered with a thin skin which resembles mucous membrane. A plexus of veins lies within the subcutaneous substance of each labium. These often become varicose during pregnancy or in the presence of pelvic tumors. They sometimes rupture during labor or from injury due

to other cause and give rise to a hematoma, or accumulation of blood within the areolar spaces.

Labia Minora

The labia minora, or nymphæ, come into view on separating the apposed labia majora. They are thin diverging folds of delicate skin containing vascular papillæ, sebaceous follicles, but no hair, fatty tis-
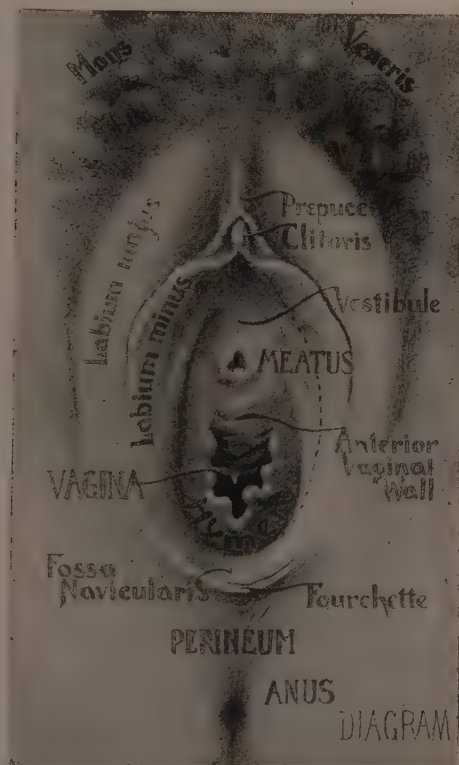
Fig. 2.—Diagrammatic representation of the external genitals of a virgin. (Dickinson— *American Textbook of Obstetrics.*)

sue, or sweat glands. Anteriorly the two labia minora meet in the middle line and divide into anterior and posterior folds to form the prepuce of the clitoris and its frenum. They contain large venous spaces resembling erectile tissue. Sometimes they are abnormally large so that they are visible protruding from between the labia ma-

jora.   In extreme hypertrophy they form what is called the "Hot-
tentot apron."

The nerve supply of the labia minora is extensive.   From a wide-
meshed network arise threads in the papillary stratum of the skin
covering the labia, which threads end in various terminal bodies or
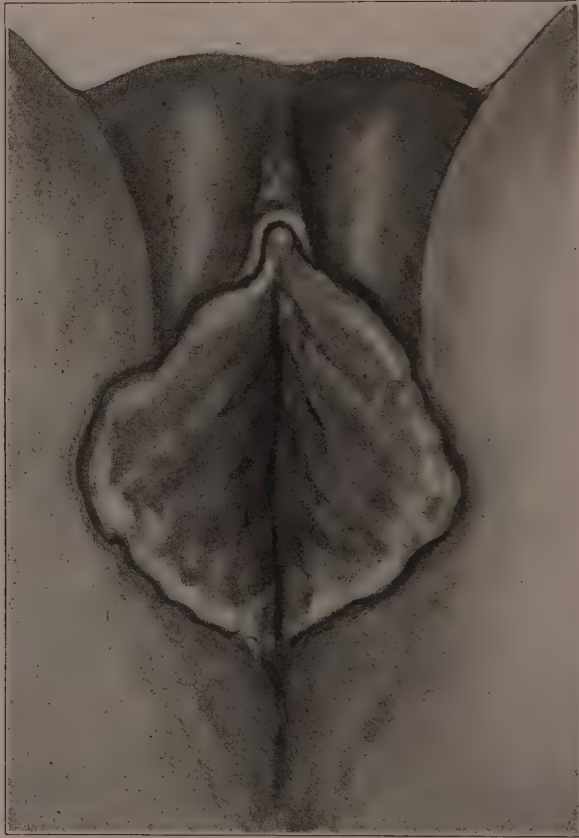
Fig. 3.—Hypertrophy of labia minora.

are distributed to the surface between the epithelial cells as fine
points.

The function of the nymphæ is to grasp the male organ during copu-
lation, to lubricate it, to aid in retaining the ejaculated semen, and to
serve as part of the seat of the sexual sensation.

Clitoris

The clitoris, the analogue of the penis, is the chief organ of sexual feeling. It is even more abundantly supplied with nerves, nerve terminals, and special organs of touch than the labia minora. Like the penis it is supplied with the special genital nerve bodies.

It has origin from the descending rami of the pubes in the crura which merge into the two cavernous bodies of the clitoris proper (corpora cavernosa). At the end is a glans, but the analogue of the corpus spongiosum is found not in the clitoris itself but in the two erectile bodies just under the skin of the vestibule and on either side of the entrance to the vagina, called the bulbs of the vestibule. A suspensory ligament attaches the clitoris to the symphysis pubis and causes it to bend downwards.

The glans of the clitoris is covered by the junction of the two labia minora, which split anteriorly to form the prepuce of the clitoris and the frenulum. In the pocket thus formed much smegma is collected from the sebaceous glands. The size of the glans clitoridis in the normal state is about that of a split pea. The whole organ is less than an inch long and is mostly buried underneath the skin of the vestibule. Under sexual excitement the organ swells, but rarely undergoes a true erection.

Vestibule.

The vestibule is stated by most authors to be the triangular space bounded by the clitoris and the two diverging folds of the labia minora, and, posteriorly, by the anterior margin of the hymen or its remains. It is covered by a smooth mucoid integument like that of the labia minora. By some authorities the vestibule is considered to be developed from the urogenital canal and therefore to be an entodermal structure.

Through the lower half of the triangle of the vestibule comes the opening of the urethra, the **meatus urinarius**. It rises above the general surface to form a sort of papilla. Just within the opening of the urethra are the orifices of the urethral glands, the so-called glands of Skene. These are the analogues of the prostatic ducts. The glands themselves lie on either side of the meatus under the vestibule and secrete a mucous fluid, especially abundant under sexual excitement.

Vulvovaginal Gland

The vulvovaginal glands (Bartholin's glands) are two racemose mucous glands lying in the tissue of the labia majora in the posterior halves. They open on each side by a duct which ends at the fold between the labium minus of each side and the lateral portion of the hymen. The glands secrete a considerable amount of mucus, which is discharged through the ducts at the height of the sexual orgasm. This is the so-called ejaculation in women. The vulvovaginal glands are analogues of Cowper's glands in the male.

Hymen

The hymen, or maiden-head, is a fold of tissue just at the junction of the vulva and vagina, which marks the boundary between the mucous membrane of the vagina and the ectodermal mucoid integument of the external genitals. In development it resembles the pharyngeal fold which separates the primitive oral cavity from the foregut. The hymen is a rather thin membrane lying at the depth of the vulva and opening into the vaginal canal by one or more orifices. In some instances the opening is lacking and the hymen is *imperforate*.

Hymens differ much in consistency, strength, and elasticity. The membrane is usually torn during the first coitus, although its presence or absence is not absolute proof for or against virginity. It is almost invariably lacerated beyond recognition by parturition, when its ragged remains are known as the **carunculæ myrtiformes**. This last term is applied by some authors to the remains of the hymen after labor and by others to the remains of the hymen after coitus. The passage of the child's head almost always tears the posterior wall of the vagina and the vulva so much that the shape of the carunculæ myrtiformes after parturition is usually that of an inverted horseshoe. Before parturition the shape is usually that of an irregular ring. This point is useful in the diagnosis of a previous labor.

The **fourchette** is the fold of skin which unites the posterior ends of the labia majora, thus forming the posterior border of the vulva. Between it and the hymen is a small depression called the **fossa navicularis**. The fourchette is torn by the first labor and with it the fossa disappears.

The term **vulva** is applied by some anatomists to the whole set of external genitals just described and in that sense is a term synon-
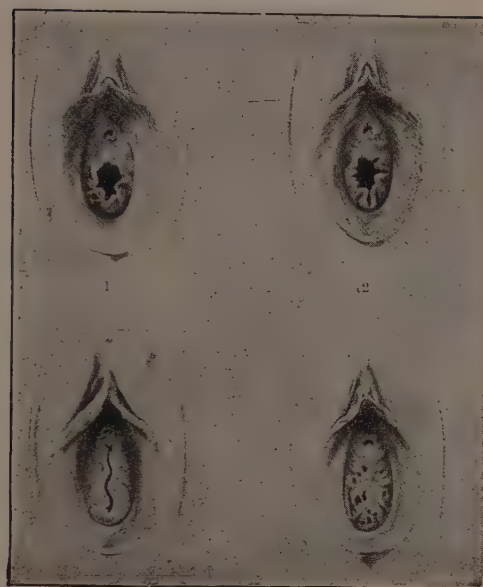
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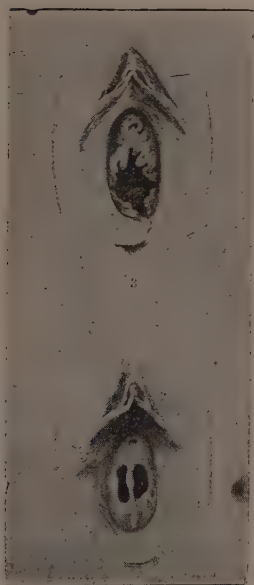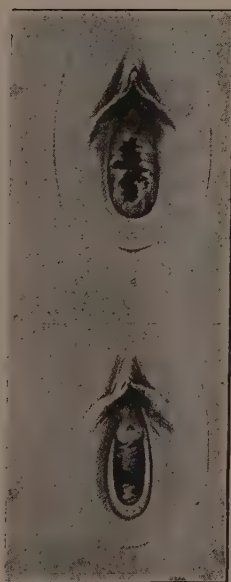
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Fig. 4.—Various types of hymen. (Dickinson—*American Textbook of Obstetrics*.)

ymous with external genitals. Strictly vulva means the slit between the labia majora. The term is derived from vulva, a folding door.

INTERNAL GENITALS

The internal genitals are those portions of the female genital system which lie entirely within the body, that is, above the hymen.

Except the ovaries, the internal genital organs are *developed from the muellerian ducts,* two embryonic tubes which run through the genital ridge close to the wolffian ducts. The uterus and vagina are formed by a median union of the two embryonic ducts, while the fallopian tubes represent the portion which remains double. Various anomalies result from incomplete union of the normally fused portions, such as duplex and bicornate uterus, uterine and vaginal septa, double cervix and double vagina. Sometimes portions of the muellerian tract on one side are wanting and thus other anomalies result, such as rudimentary horn of the uterus and rudimentary or absent tube.

Vagina

The vagina, the essential organ of copulation, is a muscular and membranous tube running in the median line of the female pelvis between the bladder and rectum. Its direction is oblique, following the curve of the pelvic canal, the so-called curve of Carus. The direction of the vaginal canal is almost at an angle of forty-five degrees with the horizon, when the woman stands erect or lies flat upon her back. At its upper termination the cervix uteri is attached to it, as if inserted into its anterior aspect at an angle of ninety degrees. Therefore, the anterior wall of the vagina is shorter than the posterior (6 cm. and 9 cm. respectively).

The vaginal portion of the cervix protrudes into the vaginal canal and beyond it, the latter tube extends as the *fornix* of the vagina. This fornix is capable of distention by the male organ and here is deposited the semen at the time of ejaculation.

There are *longitudinal furrows* separating the lateral walls of the vagina from the anterior and posterior walls so that a cross section of the canal is shaped like the letter H. The lateral walls and the mucous membrane of the longitudinal furrows are thinner than the lining of the anterior and posterior walls. Therefore laceration of the pos-

terior vaginal walls, caused by the passage of the child in labor, usually runs upwards in the longitudinal furrows on one side, or on both.

There are transverse *rugæ* both front and back, especially marked in the virgin, somewhat reduced in prominence by repeated labors, and obliterated by old age.
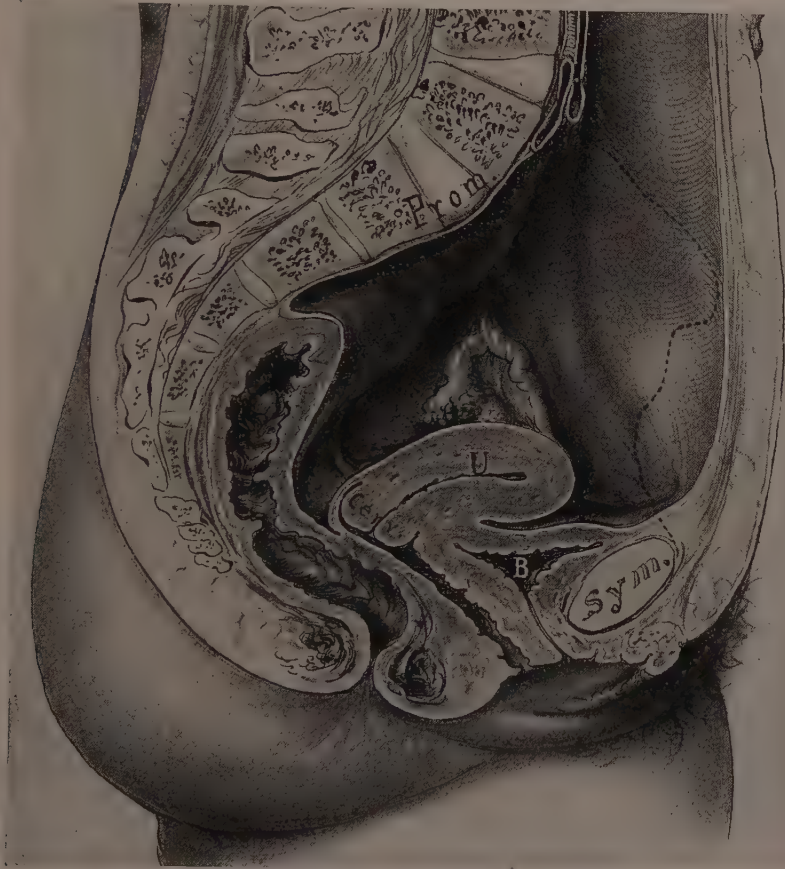
Fig. 5.—Anteroposterior section of pelvis. (Kelly—*Operative Gynecology*.)

The vagina has a mucous coat of flat stratified epithelium, a fibrous elastic membrana propria, and muscular layers. The fibrous layer is dense and rich in elastic tissue derived from the rectovaginal fascia. The lower part of the canal is surrounded by the constrictor vaginæ muscle and bands derived from the levator ani section of the pubo-

coccygeus. The muscular coat of the vagina consists of an inner circular layer and an outer longitudinal layer, both consisting of unstriped fibers.

Relations.—The vagina is in relation anteriorly with the urethra and the bladder; posteriorly, with the fibrous structures constituting the so-called perineal body, the rectum, and, at its fornix, with the peritoneum; on either side with the loose connective tissue of the pel-
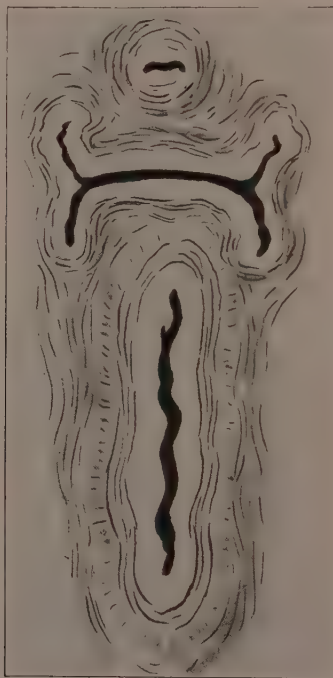
Fig. 6.—Transverse section of urethra, vagina, and rectum.

vis which is continuous with the same tissue within the folds of the broad ligament.

The **vascular supply to the vagina** is abundant, coming from the vaginal artery (analogous to the inferior vesical of the male) which supplies the middle portion of the vagina; the anastomosing branches of the internal pudic, which supply the external genitals; the anastomosing branches of the uterine, which supply the upper portion of the vagina. Corresponding with these arteries are abundant systems of

anastomosing veins. The vessels of the lower portion of the vagina have a free anastomosis with the hemorrhoidal system, and also with the vesical system. A plexus of veins surrounds the lower portion of the vagina.

There may be distinguished two groups of **lymphatics** of the vaginal region. The lower group joins the lymphatics from the external genitals and communicates with the oblique inguinal set of glands. The upper group joins those of the lower part of the uterine body and cervix, and runs out in the fold of the broad ligament. Here this group joins those from the ovary and tube of its side and communicates with the lumbar system of glands. Within the connective tissue around the upper part of the vagina the lymphatics communicate readily with those of the base of the bladder.

The **nerve supply of the vagina** is twofold. The *sympathetic* fibers come from the inferior hypogastric plexus; the main *systemic* nerve is the internal pudic nerve arising from the fourth sacral root. The latter nerve is mostly distributed to the external genitals. The fibers from the sympathetic arise from the same source as do those which are distributed to the bladder and to the uterus and all come through the ganglion of Frankenhaeuser, which lies at the side of the upper vagina and rectum. This ganglion receives many threads from the trunks of the sacral plexus. It is therefore easy to see the reason for the frequent nervous disturbances of bladder, uterus, and vagina when any one of them is disturbed.

Secretion.—The vagina at all times contains a secretion peculiar to itself, although the organ contains no glands. It may be that the pavement cells of the lining membrane themselves secrete a mucoid material, although that conjecture has not been proved. Certain it is that no glands are found except when there has been anomalous development of remains of the wolffian duct or misplaced glandular tissue from the cervix. Cysts of the vagina, on the other hand, are not very rare. They arise from embryonic remnants, from folds of mucous membrane, from dilated lymph vessels, etc.

The secretion of the vagina comes chiefly from the mucous glands of the cervix, which are very numerous and active, and from the glands of the endometrium. Some may also reach the vaginal canal by capillary attraction and imbibition from the vulvar mucous glands.

The secretion which comes from the uterine and cervical mucous membrane is alkaline in reaction, as is mucous secretion generally, but

the secretion within the vagina is *acid*. The acid present is mostly lactic acid, and is formed by the metabolism of certain microbes which are the normal tenants of the canal. The most numerous and the most constantly found is that one called Doederlein's bacillus, after the author who first called attention to the importance of the study of the secretion found in the vagina. Either because these normal bacilli actively ingest other microbes which may enter the vagina from the outer world, or because the latter are destroyed by chemical action of the secretions, it follows that the vaginal canal is free from pathogenic germs, even within one to two days after such have been introduced experimentally.

It is well known that the spermatozoa are easily killed by an acid medium; also that they are deposited within the fornix of the vagina, which normally contains an acid secretion. Posterity, however, is saved because the mucous glands of the cervix, as well, doubtless, as the glands at the entrance of the vagina, under the stimulus of the sexual excitement, secrete an excessive amount of an alkaline mucus, which probably temporarily changes the reaction of the contents of the vagina.

As a corollary to this proposition may be the observed fact that the coitus is less likely to be fruitful when there is no libido on the part of the woman.

Inasmuch as the vagina is normally sterile, it behooves the physician not to remove the antiseptic natural fluid within it by douches before labor or before operations.

Uterus

The uterus is the essential organ for the embedding and antenatal nourishment of the impregnated ovum. The uterus and tubes together constitute the **pars gestationis**. In shape the organ is like an inverted pear flattened anteroposteriorly. The size varies with age and the sexual condition of the woman. In the virgin the organ is 7.5 cm. long, 3.5 cm. maximum width, and 2.5 cm. thick (3x1½x1 in.).

The uterus is divided into a body and neck or **corpus** and **cervix**. The line of demarcation runs through the internal os. The muscular coats of the cervix and corpus are similar in structure, except that there is a relative preponderance of circular fibers and fibrous connective tissue in the cervix.

The **fundus** is the proximal end of the uterus, lying between the

uterine ends of the fallopian tubes. The external os, where the cervical and vaginal canals communicate, is completely closed in the virgin by the circular muscular fibers.

The **canal of the cervix** is roughly cylindrical, is about 3 cm. in length, and ends in the internal os uteri, the constricted portion which marks the boundary between cervical and uterine cavities. The shape of the uterine cavity is triangular, with the apex at the internal os and the angles of the base pointing into the uterine openings of the fallopian tubes.

One must be reminded that all the cavities of the body are real cavities only when they contain something. The empty bladder, for
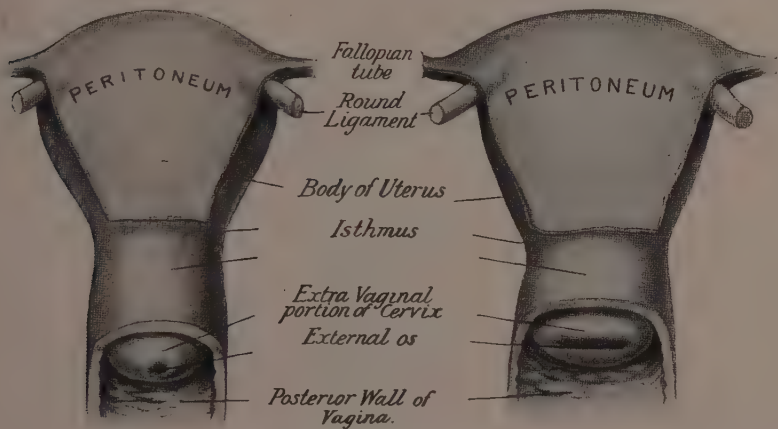
Fig. 7.—A comparison of the nulliparous with the multiparous uterus. (Edgar—*Practice of Obstetrics*.)

instance, is no longer a cavity because its walls fall together. So the vaginal, uterine and cervical cavities are only potentially such because, except for the slight amount of secretion within them, they are empty and have their walls in apposition.

The *uterine dimensions* already given hold good only for the adult virgin. In the child the cervix is longer than the body; in the nulliparous adult the canals of cervix and corpus are nearly equal; in the old woman the whole organ becomes smaller with senile atrophy. Thus we speak of certain uteri, abnormal in size or shape, as of the infantile type or of the atrophied type.

The cervix is attached to the vagina by being set into its upper end. The vagina, in the erect posture, is at an angle of about forty-five

degrees with the horizon; the cervix sets into it at an angle a little sharper than a right angle; the uterine body curves a little anteriorly so that it lies almost horizontal. Depending upon the condition of fullness of bladder and rectum the angle of the uterus with the vagina varies somewhat.

On account of these directions of the vagina and uterus, the examining finger entering the vagina comes first in contact with the anterior lip of the cervix, then with the external os, and lastly with the posterior lip. The part of the cervix within the vaginal cavity, and palpable within it, is called the **portio vaginalis**; the
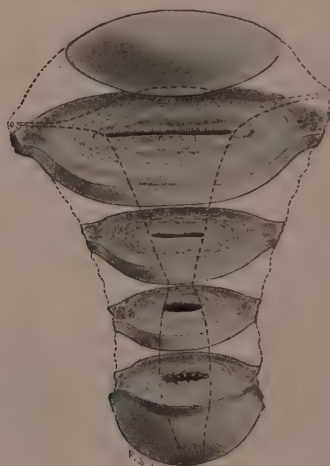
Fig. 8.—Reconstruction of the uterus, showing the shape of the cavity. (Williams—*Obstetrics.*)

portion of the cervix not included within the vagina is called the **supravaginal portion.**

The *appearance of the portio vaginalis* through a speculum is that of a truncated cone with rounded end, at the apex of which is seen the external os uteri. The os is a round closed pore in the nullipara only. It is lacerated by childbirth or miscarriage, and, after healing, appears as a transverse slit. In many instances the healed laceration divides the portio into distinct anterior and posterior lips with a wide aperture between them, admitting a finger tip. This condition of the external os is an almost infallible diagnostic sign of a previous labor.

The external surface of the portio vaginalis is covered by a stratified squamous epithelium like that of the vagina. At the external os

this abruptly changes to the columnar ciliated epithelium of the cervical, uterine, and tubal canals.

The **mucosa of the cervix** is thicker and firmer than that of the uterus and is arranged in elaborate corrugations called the arbor vitæ. The cervix has relatively few tubular glands like those of the uterus, but has numerous short expanded mucous crypts. These crypts and the rest of the cervical mucous membrane secrete mucus abundantly, especially under nervous or irritant stimulation. The mucous crypts may become occluded by inflammation and often enlarge into the pearly cysts sometimes seen through the surface of the portio
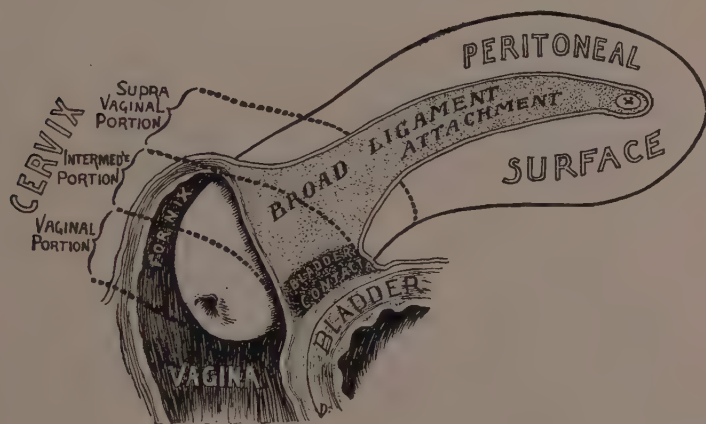
Fig. 9.—Diagram showing the relations of the uterus to the vagina and bladder and peritoneum. (Dickinson—*American Textbook of Obstetrics.*)

vaginalis and called Nabothian cysts. They are simply mucous retention cysts. The lining membrane of the cervix is called the cervical endometrium or the **endocervix.**

The **endometrium,** the lining membrane of the uterus, is a smooth velvety coating perforated by the mouths of the numerous minute glands. There is one layer of ciliated columnar epithelium which lines the cavity of the uterus and dips down to line the glands. This mucous membrane shows many so-called beaker or goblet cells, which secret mucus. A basement membrane of thin fibrous tissue supports these cells. The whole mucosa consists of these cells, the glands and a supporting structure of connective tissue rich in cellular elements.

Menstrual Variations of the Endometrium.—During the resting stage of the menstrual cycle the endometrium is thinnest, from 1 to 2

mm. During the congestive period, just before the menstrual flow, the average thickness of the uterine mucous membrane is 5 to 7 mm. The appearance of the **uterine glands** differs also with the different stages of the menstrual cycle. During the quiescent stage, the gland runs straight downwards for about two-fifths of the thickness of the
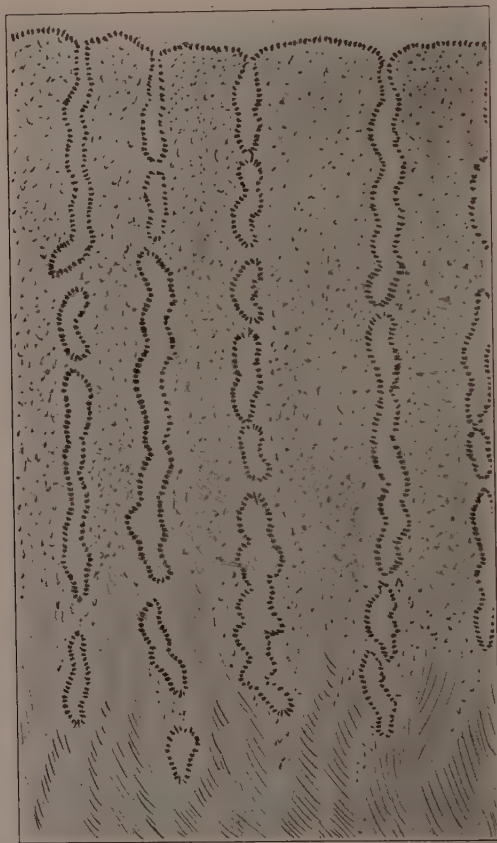
Fig. 10.—Normal resting endometrium.

mucosa and then takes a spiral course. Even normally there is some slight branching of the glands.

Cross sections of the mucosa show near the surface a compact interglandular stroma composed of a network of fine fibers enmeshing great numbers of round and spindle-shaped connective tissue cells; vertical

sections of the uterine glands; lower down there is more of the glandular part because of the spiral twists of the glands and their branching. The superficial portion is called the **compact layer** of the uterine mucosa, and the deeper, the **spongy** portion, because of these appearances.

The **decidua vera** of pregnancy is essentially the uterine mucous membrane especially hypertrophied and modified by the stimulus of the genetic reaction. The normal hyperplasia which comes with the congestive stage of menstruation has frequently been confounded
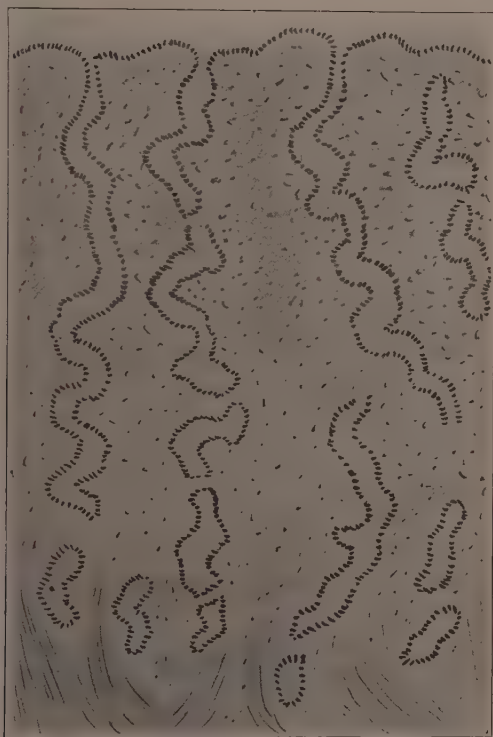
Fig. 11.—Menstruating endometrium.

with the pathological condition and the term hyperplastic endometritis is still by many authors described in terms which exactly fit the normal and physiological condition. When the normal changes every month are so great, it is hard to prove that enough hyperplasia exists to justify the diagnosis of a pathological condition.

Uterine Musculature.—The fine connective tissue fibers of the stroma of the mucosa merge imperceptibly into the fibromuscular structure of the real musculature of the uterus. This musculature consists of bundles of unstriped muscle fibers separated by connective tissue and by vascular and lymphatic spaces. **Three layers** of muscle may be distinguished: the inner layer, consisting chiefly of longitudinal bundles next to the mucosa; the middle layer, the major part consisting chiefly of circular bundles with large venous channels between the bundles; the outer layer, which consists of a network of circular and longitudinal fibers next to the serous coat and running off into the broad and round ligaments, etc.

Uterine Ligaments

The ligaments which suspend and partially support the uterus and other pelvic organs in their positions are merely folds of peritoneum within which run muscular and fibrous bundles from the uterine musculature. Between the folds of peritoneum and through the areolar tissue there situated run the vessels, lymphatics, and nerves which supply the pelvic organs.

The **uterovesical ligaments** are two anterior folds which extend from the uterus and cervix to the adjacent bladder, the space between them forming the uterovesical pouch. Along the base of the bladder these ligaments become continuous with the fibers of the pubovesical ligaments and thus act as the anterior portion of the median sling ligaments which swing the uterus between the sacrum and the pubes.

The **uterosacral ligaments** act as the posterior portion of the median sling ligaments of the uterus. They pass from each side of the cervix to the sacrum at the sacroiliac joint, forming between them the **pouch of Douglas.** This cul-de-sac is the lowest part of the peritoneal cavity when the woman lies on the back, sits, or stands. It is therefore a frequent seat of infection on account of material gravitating from other parts of the abdomen and pelvis.

The **broad ligaments** are wide folds which extend laterally out from the uterus to the walls of the pelvis. These are really the main ligamentary support of the uterus, ovaries, and tubes, and are otherwise important. Above is the tube on each side enclosed by the peritoneum of the broad ligament out to its ampullar portion, where the fold becomes a sort of little mesentery for that part of the tube, al-

lowing it to float rather freely and to fold back behind the uterus and around the ovary.

From where the end of the tube floats free from the main broad ligament, and running to the lateral wall of the pelvis, is a thickened band called the **infundibulo-pelvic ligament**. Behind the broad ligament and on a line continuous with the infundibulo-pelvic ligament, the **ovarian ligament** holds the ovary to the broad ligament, and thick fibers from it extend to the uterus. Thus the main strength of the broad ligament consists of the infundibulo-pelvic ligament and the basal portion of the ovarian ligament. This strong fibromuscular portion of the broad ligament, with its fellow on the opposite side, swings the uterus laterally between the side walls of the pelvis.
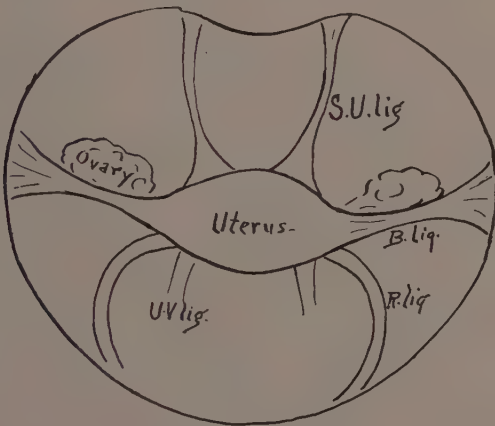
Fig. 12.—Diagram showing arrangement of uterine ligaments.

The **round ligaments** run from the horns of the uterus, just in front of the attachment of the fallopian tubes, to the inguinal canal, and thence out to the fibrous structures of the upper part of the labia majora. The ligament is composed of strong fibromuscular structure and is included within the anterior peritoneal layer of the broad ligament with which, at its upper portion, it is in close relation.

In its upper part the folds of the broad ligament are in close apposition but, lower down, they get to be some distance apart and between them is a considerable mass of loose areolar tissue called the **parametrium**. This areolar tissue extends down alongside the vagina as the paracolpium to the pelvic floor. In front of the uterus beneath the anterior peritoneal coat of the uterus, and between it and the blad-

der, this loose connective tissue joins the two lateral sections of the
parametrium. The peritoneal coat of the uterus is closely applied to
the organ throughout the rest of its extent.

The **ovarian artery** enters the broad ligament along its infundi-
bulo-pelvic appendage, rather close to the upper surface, runs spirally
to the uterus, where it branches to supply the fundus, and downwards
to anastomose with branches from the **uterine artery,** which enters
the parametrium from below. The ovarian artery sends substantial
branches to the ovary and to the tube along its course through the
broad ligament.
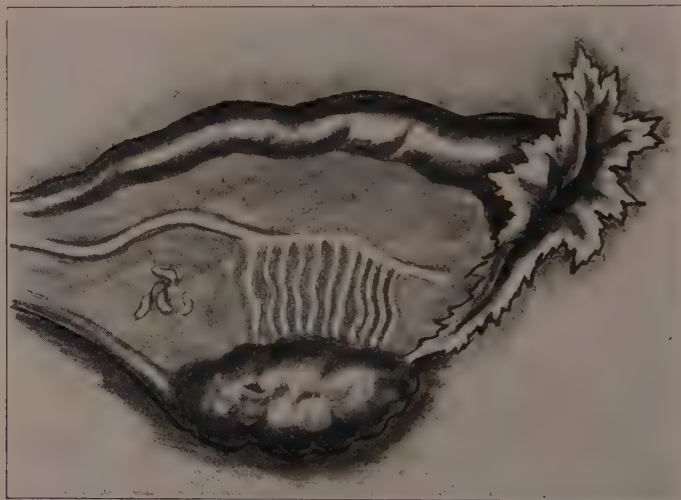
Fig. 13.—Broad ligament spread out to show parovarium and paroophoron lying between
fallopian tube and ovary.

The **ureter** enters the infundibulo-pelvic ligament somewhat be-
hind and below the ovarian artery, runs along the wall of the pelvis
and thence across the parametrium to the anterior aspect of the su-
pravaginal portion of the cervix, and thence to the base of the bladder
which lies in close relation to the cervix.

Wolffian remains, the **parovarium** and the **paroophoron,** lie in the
mesentery of the tube and in the broad ligament adjacent. These
structures are significant as the origin of cysts of the broad ligament.

The broad ligament also carries within its folds numerous nerves,
veins, lymphatic ducts and lymphatic glands. An especially marked

set of veins, analogous to the spermatic plexus in the male, accompanies the ovarian artery and may become varicose, thrombotic, or infected.

The **canal of Nuck** is a peritoneal pouch extending into the inguinal canal with the round ligament.

Fallopian Tubes

The fallopian tubes or oviducts are essentially extensions of the uterus modified to suit their different function. In most of the lower animals the oviducts are not markedly different from the bifurcated uterine body, but in the human female the line of demarcation between uterus and tube is abrupt. The thickness of the wall of the tube varies from that of thin paper in the ampullar region to about a millimeter at the isthmus.

The **musculature** of the tube consists of an inner circular layer and an outer longitudinal layer of unstriped muscle like that of the uterine body and cervix.

The **mucous membrane** of the tube is lined with cylindrical ciliated epithelial cells like those of the uterine canal. The connective tissue element of the tubal mucous membrane is much less developed than that of the uterus. The endosalpinx (mucous membrane) is arranged in extensive and complicated longitudinal folds so thin that the epithelial cells lie almost back-to-back with the intervention of a very small amount of delicate connective tissue. On cross section the lumen of the tube appears filled with delicate interdigitating arboreal branches. There are no glands like those of the uterus.

The average length of the tube is from 7 to 11 centimeters. The tube may be divided into four portions. The **interstitial** portion is that which lies within the thickness of the uterine wall. It consists only of mucous membrane, the supporting part being the muscular wall of the uterus itself.

The **isthmus** is the narrow part extending from the uterus for a little over half the length of the tube.

The **ampulla** is the wider portion extending from the isthmus to the ostium or abdominal opening, which is about 2 millimeters in diameter.

Beyond the ostium is a funnel-shaped portion, the **infundibulum**. This terminates in a large number of fimbriæ, which appear as if one cut the periphery of the funnel with scissors, leaving a fringe. These

fimbriæ are lined outwardly with peritoneum and on the inner side with the same epithelium as the rest of the tube. The longitudinal folds of the tube extend out to the fimbriæ. One rather larger fimbria
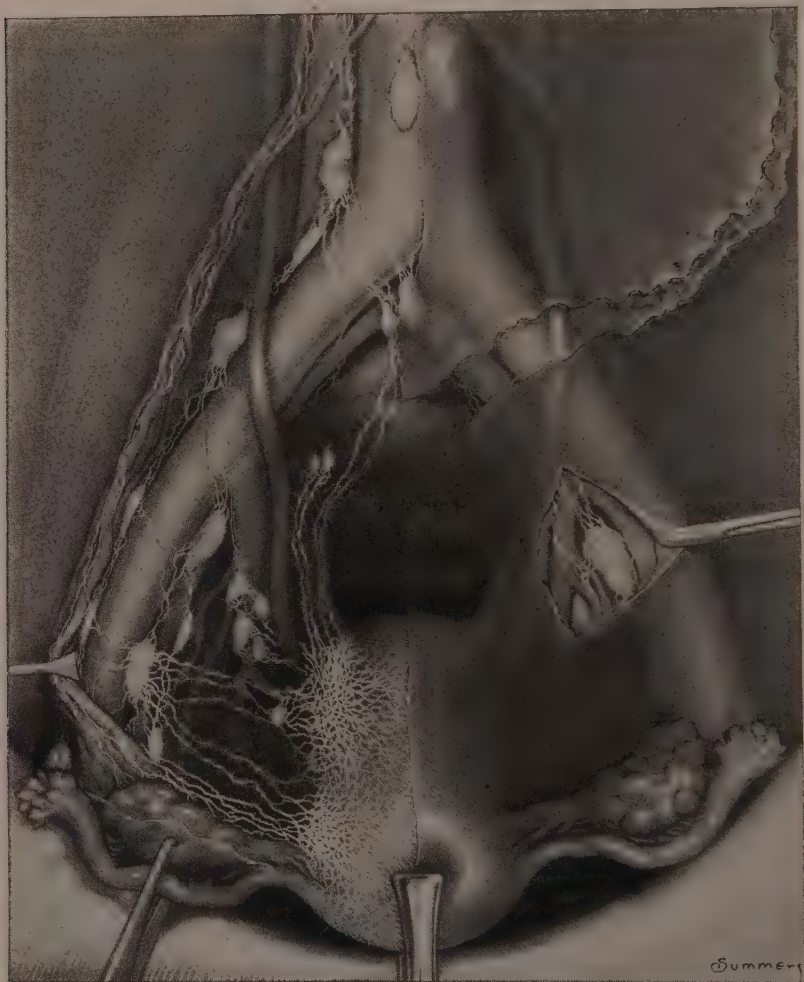
Fig. 14.—Distribution of pelvic lymphatics. (Crossen—*Operative Gynecology*.)

extends along the ovarian ligament to be attached to the ovary at its outer aspect. This is the **fimbria ovarica**.

The tubes curve backwards behind the uterus so as to partly en-

circle the ovary. The mesosalpinx is longer at the ampullar end and allows a freer movement to that portion of the tube than to the isthmus. The cilia of the tubes, uterus, and cervix all move outwardly, so as to cause a stream of fluid from the peritoneal cavity to the vagina. Thus probably the ovum is propelled from the abdomen to the uterus, and thence into the vagina, unless impregnated and embedded.
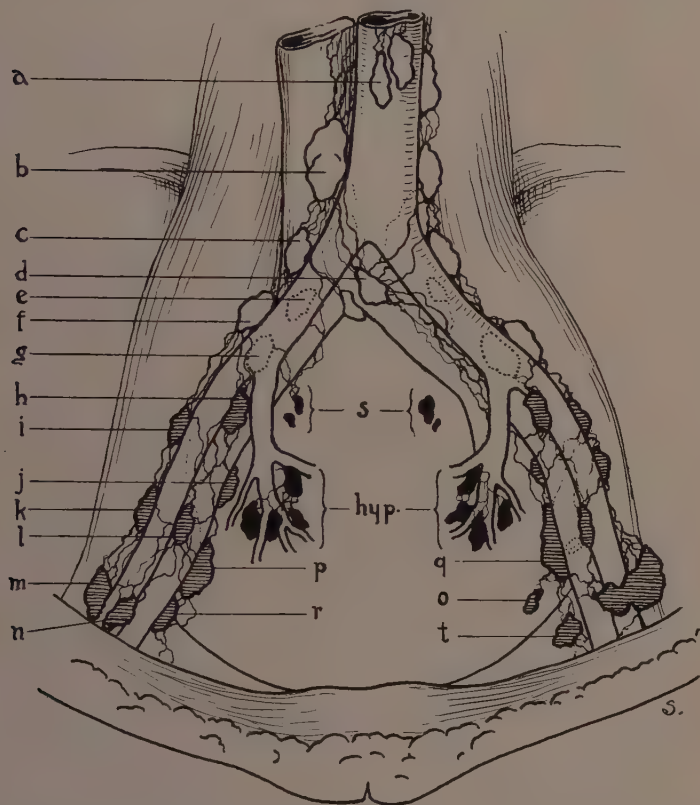
Fig. 15.—Diagram of distribution of pelvic lymphatics. *a.* Pre-aortic glands. *b.* Juxta-aortic or lumbar glands. *c, d, e, f, g.* Common iliac glands. Those indicated by *d* are called also the glands of the promontory, of which there may be one or more. The dotted outlines indicate glands lying under the vessels. *h, i, j, k, l, m, n, p, q, r, t.* External iliac glands. The external chain is indicated by *i, k, m,* the middle chain by *h, l, n,* and the internal chain by *p, r, q, t.* *o.* Obturator gland. *s.* Sacral glands. *hyp.* Hypogastric or internal iliac glands. (Crossen—*Operative Gynecology.*)

Lymphatics

A knowledge of the lymphatic system of the female genital apparatus is of importance in order to understand the disorders of that ap-

paratus, especially infections and the spread of malignant disease. The *lymph from the vulva* is carried mostly towards the inguinal chain of glands which runs parallel with Poupart's ligament and superficial thereto. The *lower portion of the vagina* also sends its lymph along a similar course to the glands of the inguinal region. The regional lymph glands for the *upper vagina and the cervix* are in the hypogastric chain which parallels each uterine artery.

The regional glands for the *body and fundus* of the uterus are those running along the common iliac artery, and for the *ovary and tube,* those running along the course of the ovarian vessels towards the upper lumbar set of glands near the kidney.

Fig. 16.—Ovary of a young woman. (Piersol, after Sutton.—*American Textbook of Obstetrics.*)

Ovary

The ovary has been designated as the **pars generationis.** It is the organ par excellence of sex characteristic, like the testis of the male. It is the essential gland for the production of the female sexual cell. Lacking its own excretory duct, it makes use of the muellerian genital tube as such an efferent passage. Besides the production of the ovum, the ovary has an *internal secretion* which is immensely important; in regulating the development of the whole genital system, both primary and secondary; in regulating the functions of menstruation

and gestation; and in influencing very greatly the whole physical and psychical being of the woman.

In the adult woman the ovary is a flattened elliptical organ whose *size* varies within wide limits in different individuals, and in the same individual at different ages. It will average, under normal circumstances, 3 to 4 cm. long, 2 to 3 cm. wide, and about 1 cm. thick. The right ovary is usually slightly larger than the left.

During fetal life and during childhood the *surface* of the organ is smooth but, with the formation and rupturing of the follicles in the process of ovulation, the surface becomes covered with scar-like depressions. Later, with the general atrophy of the whole ovary which occurs in old age, the surface appears like a mulberry.

The ovary hangs free in the abdominal cavity behind the broad ligament, attached to broad ligament, uterus and pelvic wall by the ovarian ligament already described. The ovary has not the glistening surface common to those organs which are covered with peritoneum. It is covered with a single layer of cuboidal cells, the so-called **germinal epithelium**. This epithelium, however, has a similar embryological origin to the flat cells of the peritoneum. In later adult life the cuboidal form of a large portion of this epithelial covering changes to the flat appearance of the peritoneal covering.

The **structure** of the ovary may be differentiated into a medullary portion, in which the larger vessels and nerves are situated, and a cortex, which is chiefly occupied by the essential organic elements of the ovary, namely, the graafian follicles. Entering the hilum of the ovary from the ovarian ligament, the vessels and nerves are distributed peripherally throughout the medulla to the cortex. The hilum and the rest of the medullary portion is composed of long bundles of loose connective tissues with numerous smooth muscle fibers, derived from the vessels.

The **primordial ova** are derived from the germinal epithelium, as are probably also the epithelial cells of the follicles. At birth every ovary contains about one hundred thousand primordial ova, but at puberty these have diminished to about thirty thousand. In the adult ovary the follicles are found throughout the cortical portion of the organ in all stages of development from the primordial follicle, consisting of an ovum surrounded by a single layer of follicular epithelium, to the fully developed graafian follicle ready to burst through the surface of the ovary and liberate the ripened ovum.

The **graafian follicle,** in its fully developed state, measures from 10 to 15 mm. in diameter. The outer layer of the mature follicle is called the **theca folliculi** and is composed of two layers of connective tissue. The outer layer is called the theca externa, and the inner layer, the theca interna. The vessels and lymphatics increase in size and number in the neighborhood of the theca.

Next to the theca comes the epithelial lining, derived probably from the cells of the germinal epithelium in the early embryo. This epithelial lining becomes very extensive and consists of many layers of small polygonal cells with darkly staining nuclei. This layer is called the **membrana granulosa.** At one point the membrana granulosa thickens into a mound of cells which surround the ovum, called the **discus proligerus.** The follicle is filled with a clear fluid, resulting from vacuolization of the cells of the membrana granulosa and from exudation from the capillaries, called the **liquor folliculi.**

A layer of especially differentiated epithelial cells of the granulosa adheres to the ovum after the rupture of the follicle and is arranged in a radiating zone called the **corona radiata.** Next inside this layer is the **zona pellucida,** a noncellular structure produced by the activities of the cells of the corona radiata. Within this last the ovum floats in a clear fluid of the perivitelline space.

The ovary becomes much congested during the time before ovulation and the graafian follicle with the ovum is forced to the surface. Necrotic changes occur at the most distal point of the theca, and the follicle ruptures, allowing the escape of the liquor folliculi, and the ovum surrounded by its corona radiata.

The **corpus luteum** is formed by changes in the follicle after the rupture and escape of the ovum. With the escape of its contents, the empty follicle collapses, the pressure within changes, and soon the cavity refills with blood from the congested vessels of the theca. This blood clots and serves as a basis for the growth into the cavity of the rapidly proliferating connective tissue cells of the theca.

The cells of the follicular epithelium rapidly divide and multiply and soon occupy the whole follicle (Sabotta), indeed so generously do they develop that the corpus luteum becomes many times larger than the original graafian follicle. The yellow pigment, lutein, of these cells gives a bright yellow hue to the corpus luteum. The lutein cells are supported as they grow and increase by partitions of connec-

tive tissue derived from the theca of the follicle, and bearing the vessels which nourish the new organ.

It is usual to distinguish two varieties of corpus luteum, that of pregnancy, which is called true, and that of menstruation, which is called false. The difference is one of degree and not of kind. The corpus luteum of pregnancy is usually larger and always undergoes development during a longer period of time than that of menstruation.

The full development of the *corpus luteum of menstruation* occurs about the third week, after which degeneration and atrophy take place, so that in about six or eight weeks nothing is left but a cicatricial whitish body, called the corpus albicans. The process of atrophy is accomplished by the hyaline and fatty degeneration of the lutein cells and their gradual disappearance.

The *corpus luteum of pregnancy* reaches a size twice that of menstruation. This is because of the greater size of the lutein cells in the corpus luteum of pregnancy, and of the expansion by filling with fluid of the central cavity. The corpus luteum of pregnancy begins to diminish about the fifth month, but at the end of the period remains from five to ten millimeters in diameter.

The development of the corpus luteum from the ruptured graafian follicle occurs so uniformly throughout all the mammalia and is such a definite and complicated process of development that it is natural to conclude that the body has some *function* of importance. Its structure resembles very much that of ductless glands in general. The processes of nature are often prodigal, but never wasteful. If the graafian follicle had served its purpose when it expelled the ripened ovum, one would expect that it would then degenerate and atrophy, but not that it would undergo further development into such a distinct organic structure as the corpus luteum becomes.

There is a corpus luteum for each ovulation; for each ruptured graafian follicle. The question as to the actual function has caused much controversy and many different opinions based upon different interpretations of observations and of experiments. Since 1898 the corpus luteum has been considered as a gland with an inner secretion. The exact relation of the secretion of the corpus luteum to the phenomena of menstruation and of pregnancy is not yet settled. At

least it is proved that it governs the activity of the uterus and regulates its trophic centers.

Fraenkel found that destruction of the corpora lutea in rabbits before the middle of the period of gestation caused the animals to abort. He also observed in women upon whom he had occasion to operate for prolapse and in whom the adnexa were intact that destruction, with the galvanocautery, of the corpus luteum caused the next menstruation to be delayed, usually from four to eight weeks. It has for some time been known to gynecologists that removal of ovaries during pregnancy will usually cause the women to abort if done in the first few months and seldom if done in the later part of the gestation.

It is probable that the chemical products of the secretory activity of the corpus luteum act upon the trophic centers of the uterus to set up the phenomena of the next menstruation. It is also probable that the chemical products from the excessively developing corpus luteum of pregnancy act to cause the increased nutrition of the uterus necessary for the embedded ovum and to prevent the degenerative changes which cause the bleeding and the exfoliation of mucous membrane of the destructive stage of menstruation.

The Pelvic Floor

The fortunate arrangement of the bones, ligaments, muscles and fasciæ of the pelvis prevents the contents of the abdomen and pelvis from escaping from the pelvic canal under the influence of abdominal pressure. The curve of the sacrum and coccyx makes the curve of the canal and serves as a bony basis for attachment of ligaments and muscles.

The two **sacrosciatic ligaments** fill in the posterior openings on each side of the sacrum and coccyx between those bones and the ischium and ilium. The greater sacrosciatic ligament runs from the posterior inferior spine of the ilium, the lower portion of the sacrum, and the coccyx to the inner margin of the tuberosity of the ischium.

The lesser sacrosciatic ligament runs from the lower lateral margin of the sacrum and coccyx just in front of the greater ligament to the spine of the ischium. These two ligaments convert the sacrosciatic notch into foramina, the superior and inferior sacrosciatic foramina. With the attendant muscles they comprise the posterior portion of the pelvic wall. The lower margin of the greater ligament, running from

the coccyx to the tuberosity of the ischium, forms on each side the posterior margin of the rhomboid opening of the pelvic outlet, the so-called inferior strait.

The **pelvic floor proper** consists of the muscles and other structures which, pierced by the urethral, vaginal and rectal orifices, sup-
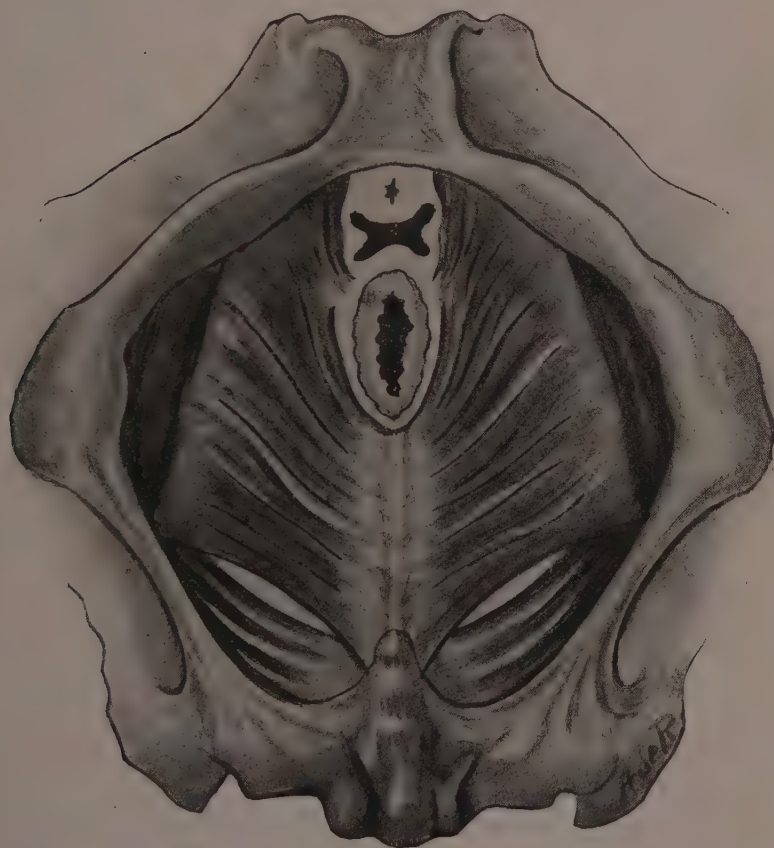
Fig. 17.—Floor of pelvis showing levator ani and coccygeus.

port and close the pelvic outlet and dilate to permit the passage of the child during labor. The pelvic floor reaches from the skin outside to the peritoneum inside. It is divided by the vaginal slit into a sacral and a pubic segment.

The **pubic segment** is triangular in shape, with the apex at the

symphysis pubis, and consists of the urethra, the anterior vaginal wall, and the intervening dense fibrous tissue.

The **sacral segment** is the most important portion from the standpoint of the gynecologist and obstetrician. It extends from the vaginal slit to the sacrum, coccyx, sacrosciatic ligament, and tuberosity of the ischium. The structures of the pelvic floor overlap each other somewhat after the analogy of the structures about the inguinal
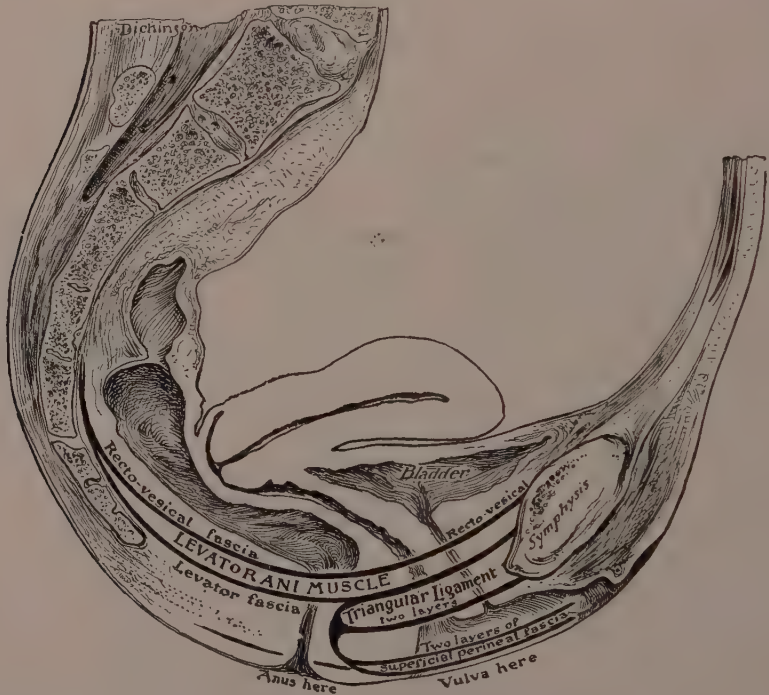
Fig. 18.—Diagram of an anteroposterior section of the pelvis, showing the various fascial layers of the pelvic floor. (Dickinson—*American Textbook of Obstetrics.*)

canal. When these structures are intact their overlapping prevents the contents of the pelvis from prolapsing through the rectal opening and through the vaginal canal.

From the standpoint of gynecology the essential muscle of the pelvic floor is the **pubococcygeus;** the coccygeus, and the levator ani. The coccygeus is a triangular sheet passing from the spine of the ischium to the adjacent surfaces of the sacrum and coccyx, supple-

menting the levator ani. Its analogue in the caudate mammals is the depressor of the tail. Its function in the human female is to supplement the levator ani as a support to the rectum.

The important muscle is the **levator ani,** often referred to as the pelvic diaphragm. This muscle hangs like a sling open in front; its cross section is the form of a horseshoe. It arises on each side from the long ramus of the pubes, from the fascia along a curved line from the back of the pubes to the ischial spine below the iliopectineal line. This line, called the "white line," marks the division of the pelvic fascia into layers, one of which is the obturator fascia. The muscle also arises from the inner side of the ischial spine in front of the origin of the coccygeus.

The muscle is inserted in the middle line behind to the coccyx and therefore acts partly in the caudate mammals as a depressor of the tail. Anteriorly it is inserted into its fellow to make the sling already mentioned. Some of its fibers join to make the sphincter of the vagina; the belly of the muscle swings backwards horizontally (in the erect posture), surrounding and supporting the rectum. The anterior margin of the sling of this muscle is situated about 1.5 cm. from the vaginal orifice on either side. Its contraction brings the lower part of the rectum and the vagina forwards towards the pubes. Its constant function is to act as a muscular support to the pelvic contents, supplementing the fasciæ of the floor of the pelvis.

The **fasciæ of the pelvic floor** are important factors in supporting the contents of the pelvis. The **pelvic fascia** is a direct continuation of the iliac and the transversalis fasciæ. It is attached laterally along the pelvic brim and around the origin of the obturator internus. Posteriorly it extends over the pyriformis muscle and the nerve trunks as far as the sacrum. In front it closely follows the line of the obturator internus; it aids in bounding the inner opening of the obturator canal; and, at the lower part of the symphysis, it becomes attached to the anterior pelvic wall.

The **rectovesical fascia** splits off from the pelvic fascia at the "white line" and lies above the levator ani. It is essentially the fascia of that muscle. It is of great importance in enabling the pelvic floor to resist abdominal pressure at the outlet. It splits into the vesical, the vesicovaginal, the rectovaginal, and the rectal fascial layers.

There are certain muscles of the perineum which lie superficial to the levator ani and which are of some account in consideration of the pelvic floor. The **transversus perinei** runs across the perineum from the tuberosity of the ischium on each side to be inserted into the central tendinous portion of the perineum just behind the vaginal orifice. Its function is to draw the anus and vulva forwards. The **sphincter ani** externus is attached posteriorly to the coccyx and extends around the anus and lower rectum. Its name implies its function. The **bulbocavernosus** arises from the tendinous central part of the perineum and passes towards the pubes around the vulva to be inserted into the crura of the clitoris and the region about that organ. Its function is partly as a constrictor of the vaginal opening but mainly as an erector of the clitoris.

CHAPTER II

MENSTRUATION AND OVULATION

MENSTRUATION

Menstruation is the periodical loss of blood, accompanied by certain anatomical changes in the genitals, certain changes in the body generally, and certain psychic and neurotic changes in the woman, which marks her sexual life. Menstruation, in most women, recurs about every four weeks from the thirteenth to the forty-fifth year, except during pregnancy and lactation.

The time of the beginning of menstruation, called the *menarche,* varies in different races and, to a less degree, in different climates, from the twelfth to the fifteenth year of age. The menarche is coincident with *puberty* in the female. It is the outward and visible sign of the sexual ripening of the girl. At this period the subcutaneous fat increases and rounds out the womanly contour of the body. The breasts fill out, the pubic and axillary hairs appear, the voice takes on a richness of tone and the girl acquires the habits and characteristics of a woman.

The time of cessation of menstruation, called the *menopause,* varies much in individual cases, but seldom occurs before forty-five or delays after fifty years of age. This period is called the *climacteric,* or period of the change of life. The interval of about thirty years between menarche and menopause constitutes the active sexual life of woman, during which she is capable of bearing children and otherwise performing her sexual functions.

OVULATION

Ovulation is the process of ripening and expulsion from the ovary of the mature ovum. In time ovulation closely runs with menstruation, occurring once in four weeks except during pregnancy and lactation. It begins at puberty when menstruation begins, and ends at the climacteric when menstruation ceases.

The exact relation in time and in etiology between each individual
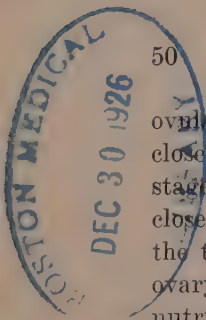
ovulation and menstruation is uncertain, but is known to be very
close in both particulars. The ovaries are filled with ova in various
stages of development. As they become more mature, the ova en-
closed in their graafian follicles approach nearer to the surface. At
the time of ripening the follicle protrudes above the surface of the
ovary, is filled to bursting, and allows the ovum with its attendant
nutritive cells to escape into the abdominal cavity and thence into a
fallopian tube. Rarely, in the human species, two or more follicles
with their ripened ova rupture.

The ovum is assisted in its passage into the tube by the general cur-
rent of the fluid of the abdomen and by the peristaltic contractions
of the muscle fibers in the wall of the tube. Somewhere in its jour-
ney, usually in the ampullar portion of the tube, the ovum meets
the fertilizing spermatozoon which has been lying in wait for it, be-
comes impregnated, and thus becomes a new individual.

It passes on down the tube into the uterus where it finds the mucous
membrane of that organ prepared for its reception by the prelimi-
nary processes of menstruation. It becomes embedded in the uterine
mucosa and continues its development. Thereupon the mucous mem-
brane develops further as the decidua vera and menstrual flow does
not occur.

Usually, of course, the ovum meets no spermatozoon, passes down
the tube like any piece of debris, dies, and disappears. Thereupon
the uterine membrane undergoes degeneration and the menstrual
bleeding occurs.

PHYSIOLOGY OF MENSTRUATION

The beginning and ending of the menstrual life are critical periods
for the woman. The menarche often appears without warning and
without unpleasant symptoms. Often it begins with numerous mental
and nervous disturbances, varying from slight irritability of temper
to mania. In the beginning the periods may not be regular, the inter-
vals may be longer or shorter than normal, and the duration of each
may be longer or shorter than normal. In a few months the regular
type of duration and interval becomes established, to be characteristic
of the individual during her sexual activity. The duration is usually
from two to five days, the interval twenty-eight days, and the amount

of blood voided at each menstruation from twenty-five to fifty cubic centimeters.

At each menstruation there is likely to be more or less discomfort, even amounting to actual pain in the lower abdomen and back. The nervous system is slightly disturbed. The breasts enlarge and become slightly tender. The sweat and salivary glands secrete more abundantly. Temperature is slightly elevated and the body weight is temporarily somewhat increased.

In most women there are some *preliminary symptoms* of each menstruation, such as tingling and swelling of the breasts, slight disturbance of digestion, constipation or diarrhea, and more or less pain in the lower abdomen. In a few days the flow of blood appears, sometimes without warning, often accompanied by a little discomfort or even pain referred to the pelvis.

The *bloody discharge* is marked for one or two days and then diminishes, finally becoming watery and mucoid. Unless there is an abnormal quantity, the menstrual blood does not clot, probably because it is mixed with considerable alkaline mucus. Much clotting denotes a diseased condition of some kind. The odor of the menstrual discharge is sweetish, rather pungent, and, towards the end of the period, disagreeable. Normally the smell is never foul or cadaveric.

The *sexual feelings* are slightly diminished during the day or two of the greatest discharge, but are heightened for several days thereafter. The length of time from the beginning of one menstrual period to the beginning of the next is called the *type* of the menstruation. It is spoken of as a twenty-eight day type, a thirty day type, etc. The time the flow lasts is called the *duration* of the menstruation.

The periodical bloody discharge and the secondary characteristics of the rhythmical phenomena of menstruation already described are produced because periodical alterations in the female generative organs of a perfectly definite anatomical character occur to cause these outward signs and symptoms.

The **climacteric** is the epoch of the cessation of menstruation, or the menopause. About this time ovulation and power of reproduction also cease. Sexual desires usually diminish and gradually cease altogether. The uterus, vagina, tubes, ovaries, and even the external genitals undergo gradual atrophy. The body fat either increases in amount, especially about the hips and abdomen, or considerably diminishes so that the skin becomes wrinkled and

flabby. The breasts atrophy in their glandular portions but often acquire much adipose tissue. In short, the general appearances of senility begin with the beginning of the climacteric.

The climacteric stage is a critical period, even more than the stage of puberty. There are often neurotic symptoms of various kinds such as hot flashes, insomnia, mental irregularities, palpitation of the heart, and irregular pulse.

The menstrual flow, in most instances, diminishes gradually. The duration becomes shorter and the intervals longer. In some cases, however, the cessation is abrupt. Menstrual life prolonged much beyond the usual time of cessation or irregular hemorrhages occurring at this time may be signs of malignant disease or other serious trouble and should be carefully investigated by the physician.

ANATOMY OF MENSTRUATION

Numerous observations and experiments have now given us a fairly definite knowledge of the anatomy of menstruation. Gebhardt recognized *three stages* in the anatomical process of menstruation.

The first stage is that of **premenstrual congestion.** It takes place during several days before the flow appears. The whole mucous membrane of the uterus swells to twice its usual thickness. The blood vessels dilate, red and white cells and fluid of the blood extravasate into the intercellular spaces. The uterine glands, by increase in size of their individual cells and probably also by increase in number of these cells, lengthen and become spiral in shape.

The interglandular portion of the mucous membrane, the connective portion, increases in thickness by extravasation and by increase in size of its cellular elements. Some of these cells take on the size and appearance of the so-called decidua cells of pregnancy. It is difficult or impossible to distinguish them individually from the latter. Overfilling of the blood vessels increases, and red corpuscles in increasing numbers escape by diapedesis into the stroma, where they form minute areas of extravasated hemorrhage. Some of the red corpuscles find their way into the glands, or through the lacerated epithelial layer of the uterine mucous membrane, into the uterine cavity and thence into the vagina and the outer world. At this time the "flow" has begun, and menstruation, in the popular sense, has become manifest.

The second stage, that of **degeneration** of the blood vessels and cells of the mucous membrane, has already begun before the actual hemorrhage has taken place. Indeed, the degeneration of the vascular walls is probably the reason that the blood escapes. This is, in great measure, not a fatty but an amyloid degeneration of the walls of the vessels. The cells of the mucous membrane undergo more of a fatty degeneration.

A very small portion of the mucous membrane probably is cast off in shreds here and there, but the great loss of tissue which was formerly thought to occur is never observed under normal circumstances. The period of degeneration lasts during the bleeding. During the latter portion, however, in some places within the mucous membrane of the uterus, even while slight hemorrhage is oozing in other places, reparative processes are under way.

The third stage is that of **regeneration,** during which the generative organs repair the slight losses which occurred during their maximum activity. During this stage the extravasated blood which did not escape into the uterine cavity is absorbed, as are the dead and degenerated cells. Numerous cells can be observed undergoing mitotic division, which is always a sign of active growth in tissue.

This reparative stage lasts a few days and then gradually merges into the **stage of rest,** which takes up about half of the time. Then the cycle begins again and another menstrual period occurs.

All the genital organs partake of the congestion of the uterus during menstruation, and all consequently swell more or less. Some authors have observed a sort of *menstruation in the tubes,* resembling in kind, but not in degree, that of the uterus. The ovaries enlarge from increase of the blood within them, the tubes, pelvic ligaments, and interligamentary areolar spaces, the vagina and even the external genital organs, share in the general congestion. The *cervix* manifests its activity during menstruation by an increased secretion of mucus from its glands. The secreting glands of the vulva and urethra increase their activity, and, in short, the whole female genital system undergoes periodically a rhythmical cycle.

CAUSATION OF MENSTRUATION

The etiology of menstruation is too vast a subject and too much disputed for us to discuss more than superficially. Why do all these

anatomical processes follow each other so regularly and what produces them? What is the object of menstruation? In what manner can the welfare of the woman and of the race be advanced by this complicated and apparently wasteful process, which so much resembles a diseased condition?

The older theories of the etiology of menstruation have been exploded and will be passed by. A later one, which still is mentioned in many textbooks, and which many of us were taught, is that of *Pflueger*. His theory is that the growing graafian follicle, as it ripens, presses upon the sympathetic nerves of the ovary and irritates them. Reflexly the blood vessels of the internal genitals are caused to dilate, and the phenomena of the menstrual epoch result. It is true that irritation of the ovary may produce hemorrhage from the uterus, as has often been proved by experiments and by operations on the ovaries.

Biochemical Theory.—Halban and others found that ovaries transplanted into the subfascial region of the posterior abdominal wall would functionate and produce ripened ova. Although such ovaries were necessarily removed from all connection with the pelvic organs, menstruation went on just the same. When the ovaries are entirely removed, ovulation and menstruation both cease and the symptoms of the menopause come on as if the patient had arrived at the climacteric period of life. Therefore it was suggested that the relation between the ovaries and menstruation was a chemical one and not a nervous reflex.

That the chemical substance which stimulates the uterus to undergo the changes of menstruation and the building of the decidua of pregnancy comes from the glandular activity of the ovary, and largely, indeed, from the glandular activity of the corpus luteum, is probable. The theory of the influence of the secretory function of the corpus luteum is still only a working hypothesis, but is the best explanation so far made.

The *corpus luteum,* developed after the bursting of a graafian follicle, attains its fullest development about three weeks after the escape of the contained ovum. Its secretion seems to act upon the blood supply of the generative organs, especially the uterus, so as to cause active hyperemia which in turn causes the development of the menstrual decidua and the other premenstrual phenomena. If an impregnated ovum (probably the one from the follicle which bursts

a little while before the stated menstruation) reaches the uterine cavity, it finds the mucous membrane prepared for it in the shape of the so-called menstrual decidua and embeds itself by the phagocytic action of its trophoblastic layer of ectodermal cells.

Chemical bodies formed during the vital metabolism of the embedding ovum and the secretion of the further developing corpus luteum of pregnancy cause the endometrium, instead of undergoing degeneration as usual, to continue its development into the decidua vera of pregnancy. Therefore, the blood vessels of the uterine mucous membrane, with their nutrition maintained, do not allow the escape of blood as in the bleeding stage of menstruation, and the wonderful changes of pregnancy are in full swing. The development of the corpus luteum verum continues until about the middle of pregnancy and then the organ retrogresses, seeming to be no longer necessary to the organism or to the process of gestation.

If no impregnated ovum reaches the uterine cavity there is no further stimulus from the corpus luteum or from the rapidly growing impregnated ovum and consequently the endometrium, with its vessels, degenerates, hemorrhages occur, and the woman menstruates. It will be remembered that the corpus luteum of menstruation has already reached its full development before the acme of the congestive stage of menstruation. Now begins the development of a new corpus luteum of menstruation from the ruptured graafian follicle corresponding to the ovulation just passed.

CHAPTER III

DIAGNOSTIC METHODS

HISTORY

History taking, sometimes called *anamnesis*, is the process of ascertaining from the patient or from others who have knowledge of the circumstances, facts which bear upon the case in hand and which aid in making the diagnosis. Each gynecologist will have his own favorite method of questioning and recording the data obtained by means of the questioning. Everyone should, in order to attain definite results, follow some definite method.

The necessity of *preserving the records* of cases will be apparent to everyone. Some method of filing must be adopted and the system chosen must not be so cumbersome as to take more time than one's practice itself. A card index system or cards adapted for the writing of histories is excellent but requires much time to keep in good order. It is advantageous when one can have an assistant or a secretary. Otherwise a good plan is to write the history, the physical findings and the notes from time to time on slips of paper, and keep these in an envelop marked with the name and address of the patient. Thus one can use notes made at the moment at the bedside or in the examining room and can slip the envelop into his pocket when he makes a visit to the patient. If one employs a secretary, these fragmentary notes can be neatly copied at convenience upon filing cards of proper size.

First should be recorded the full *name and address* of the patient, with the name and address of the husband or other male protector.

Next should come the *age*. Certain disorders are prone to affect certain ages while certain others are rare or impossible at certain ages.

The *civil state* should be mentioned. If married, the record should state how long; if married more than once, how long each time, and how long the interval between the marriages. If widowed, the record should state how long married and how long widowed; if divorced, how long separated from the husband.

The *residence*, both past and present, is important in the consideration of malaria, rheumatism, tropical diseases, tuberculosis, and other infectious diseases. The condition of housing may involve exposure, filth, lack of air and light, and excessive exertion in climbing a large number of flights of stairs.

Occupation is important in relation to morals, occupational diseases, and hygienic condition of working places. Standing in a hot atmosphere, heavy lifting, running a sewing machine, and similar work tend to aggravate prolapses of the pelvic organs. Sedentary occupations increase the feminine tendency to constipation with its attendant evils. In certain occupations there is more likelihood of acquiring venereal diseases than in others. The *husband's occupation* has an influence upon the physical condition of the wife in many ways. An ill-paid occupation means improper food and housing, overwork, mental worry and other conditions conducive to ill health on the part of the woman. Certain men's work involves greater liability to the infection by the germs of syphilis and gonorrhea and their transmission to the wife.

The **family history** is of some importance in that it gives light on hereditary taints such as hemophilia, nervous or mental disturbances, epilepsy, alcoholism, criminality, and other factors which may play a part in rendering the particular constitution of the patient susceptible to many disorders. A history of tuberculosis in the immediate family, especially at a time during which the patient was liable to infection from intimate association with the tuberculous member, will enhance the probability of tuberculosis being a factor in her present condition.

The **previous history** is of the greatest value in the making up of a diagnosis. If possible the patient's childhood history should be ascertained; at what age she walked, whether she was a healthy baby, whether she had chorea, rheumatism, cough, heart symptoms, digestive disturbances or fevers in early life. Was she bright or dull in school work? She should be questioned as to any illnesses during her adult life, any operations, injuries, or infections.

The **sexual history** is of the utmost moment and should be brought out in detail. At what age did *menstruation* begin? Did it show any irregularities at the time of the beginning? What is the type, and what is the duration of each period? Is menstruation painful, scanty, normal or profuse; if painful, at what part of the period

does the pain come on, how long does it last and where is it located? Is there menorrhagia (excessive flow during the menses) or metrorrhagia (excessive flow during the intervals)? Do clots come away? Are there any attendant symptoms, such as headache, backache, bowel disturbances, or nervous troubles? Are the menses regular? Have there been periods of amenorrhea (lack of menstrual flow)? Any abnormal discharges between the menses should be inquired into; the color, amount, consistency, and odor. If known, the history of any previous infections or venereal disorders of the genitals should be obtained, but tactfully withal.

The *previous pregnancies* should be the subject of minute inquiry. The number and the dates of all labors and miscarriages should be recorded and the probable cause of the latter, whether induced or spontaneous. The severity and duration of each labor should be stated and whether spontaneous or operative. The results of each labor and miscarriage are important to note. Were any of them followed by hemorrhage, by infection, by chills or fever, by prolonged stay in bed, or by prolonged invalidism? The condition of the children is important; their health, if living; the dates and causes of their deaths, if dead. The amount of milk at the different lactations, the character of the milk and the duration of each period.

The **history of the present illness** for which the patient comes for advice should begin at the first symptoms noted by her; what they were and when they first occurred. One should inquire as to *pain;* its location, character, duration, and severity. Is there dysmenorrhea (painful menstruation); dysuria (painful urination); dyspareunia (painful copulation); dyschezia (painful defecation); pain in back, groin, abdomen, pubic region, or thighs?

Has the patient noticed any *tenderness* or any *swelling?* Have there been any *urinary* symptoms, such as burning and smarting on urination, increased amount of urine, or increased frequency of micturition? On the other hand, has there been any decrease in amount or frequency of urine? Inquire as to the *digestive function;* constipation, diarrhea, nausea, vomiting, distress after eating, flatulence, colic.

If there have been any *discharges* since the present illness began, their character, amount, duration and frequency should be found out. Inquire about symptoms in all the systems of the body, because all may influence the gynecological ailment and the latter may influence

them. Let the patient describe in her own way the feelings and disturbances referable to her pelvis. A skillful question now and then will keep the narrative from straying too far into unprofitable fields.

PHYSICAL FINDINGS

The physical findings, that is, the results of the examination which one makes of the bodily condition of the patient in distinction from what the patient or her friends relate, are next to be considered. Indeed, it will often happen that the physical examination may better be made before the whole anamnesis has been secured. Sometimes further questioning at a later visit will reveal many things which may have been previously forgotten by the patient or the doctor.

The physical findings include *inspection* (what one sees), *palpation* (what one feels), *percussion, auscultation, mensuration* and the *special examinations,* such as microscopic, endoscopic, chemical, etc.

The *general appearance* is first observed by inspection. The bodily form, the existence of deformities, the gait, the posture, protuberances, the general development and nutrition, the color and general appearance of the skin, cyanosis, flushing, pallor,—all tell much in a preliminary way and often guide one in his further examination. The expression of the face, as to pain, intelligence, age, and other characteristics often becomes a valuable factor. The height and weight and often other measurements should be taken and recorded.

To be complete the *detailed examination* of the body should begin at the head and continue to the soles of the feet, but in most cases the systems or organs most likely to be affected should be examined first. Indeed it is seldom necessary or advisable to burden the patient at one interview, with the fatigue of an absolutely complete scientific examination. From a gynecological standpoint the following may be valuable: the eye reactions, the condition of the lips and mucous membrane of the mouth, the neck as to goiter or enlarged glands, the chest as to lung or heart disorders, the back as to spinal deformities, the legs as to shape, abnormal curvatures, scars, swelling, varices, the groins and axillæ as to scars and enlargements.

The *breasts* by their size and shape may suggest tumors, hypertrophy, or abscesses. Palpation will reveal their consistency, whether tender to the touch, and the condition of the circulation. The color

and appearance of the nipples may suggest pregnancy or may be evidence against it. The presence of secretion within the ducts, the presence of enlarged follicles and of much pigment in the areolæ may be evidence of pregnancy or the puerperium. In connection with disorders of the breasts, especially infections and tumors, one should carefully examine the axillæ for enlarged glands.

Abdominal Examination

The abdomen in gynecological cases must be explored in detail. The patient should recline upon a suitable table, couch, or bed, should

Fig. 19.—Patient prepared for abdominal examination. (Crossen—*Diseases of Women.*)

have the head and shoulders somewhat elevated and the legs slightly bent so that she can be entirely relaxed. For the purposes of recording examinations, it is well to follow some definite scheme of division of the abdomen into areas.

Some divide it into *four quadrants* by a median line crossed by a perpendicular line at the navel. Thus the four regions would be the upper right, lower right, lower left, and upper left quadrants.

A more elaborate method is to run two imaginary lines parallel to the median line through the cartilaginous junction of the eighth ribs and cross them by two other parallel lines, the upper through the cartilages of the ninth ribs, and the lower through the highest part

Fig. 20.—Abdomen divided into quadrants. (Crossen—*Diseases of Women.*)

of the iliac crests. Thus the abdomen is divided into *nine regions,* which are, reading from right to left and beginning above, as follows: right hypochondriac, epigastric, left hypochondriac, right lumbar, umbilical, left lumbar, right inguinal, hypogastric, left inguinal. Using this latter scheme one can designate accurately the precise location of a tumor or other abnormality.

Inspection of the abdomen shows its size and shape, the existence

of local swellings, dilated veins, pigmented areas, striæ and the condition of the umbilicus.

Palpation shows the tension of the walls; areas of tenderness; location, shape and consistency of tumors and other swellings; fluid within the peritoneal cavity or within localized cystic areas; fluctua-
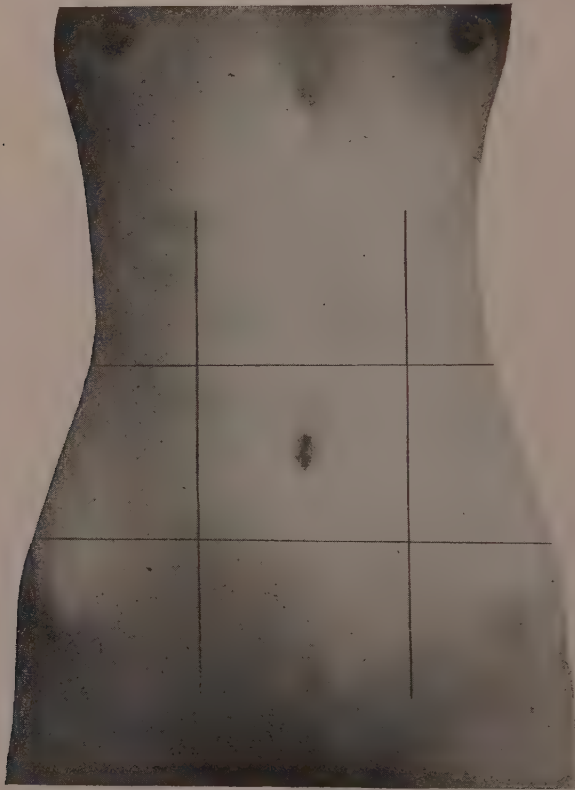
Fig. 21.—Abdomen divided into nine areas.   (Crossen—*Diseases of Women.*)

tion waves, ballottement, etc.; the condition of the bladder, and fecal accumulations.

In palpating the abdomen the examiner should see that his hands are warm and he should begin very gently.   Thus he will avoid irritating the abdominal walls and causing contractions which may defeat the object of examination.   One should not poke with his finger tips; rather let him apply the flat of all four fingers to the abdominal wall,

Fig. 22.—Palpation of abdomen. (Crossen—
Diseases of Women.)

Fig. 23.—Deep palpation of abdomen. (Crossen—
Diseases of Women.)
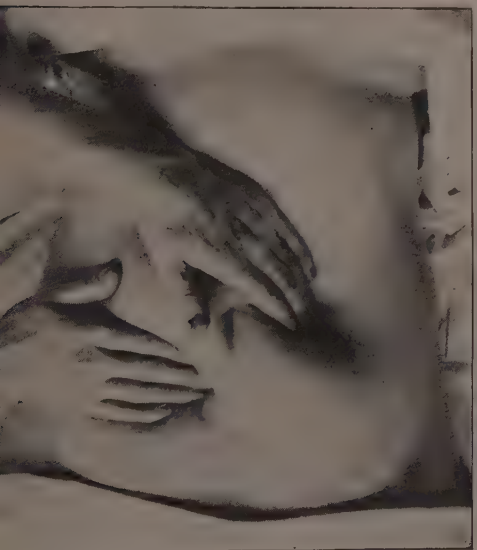
Fig. 24.—Palpation with both hands. (Crossen—
Diseases of Women.)

Fig. 25.—Deep palpation with both hands.
(Crossen—*Diseases of Women.*)

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moving them gently to and fro with the subjacent integument and occasionally making short gentle quick pressure to detect any tense objects lying within. Fluctuation is obtained by holding one hand firmly against one side of the object tested and tapping with the finger upon the opposite side. In women with fat or very flabby walls an assistant must place his hand on edge against the abdomen between the hands of the examiner so as to take up the wave which may pass along through the subcutaneous tissues.
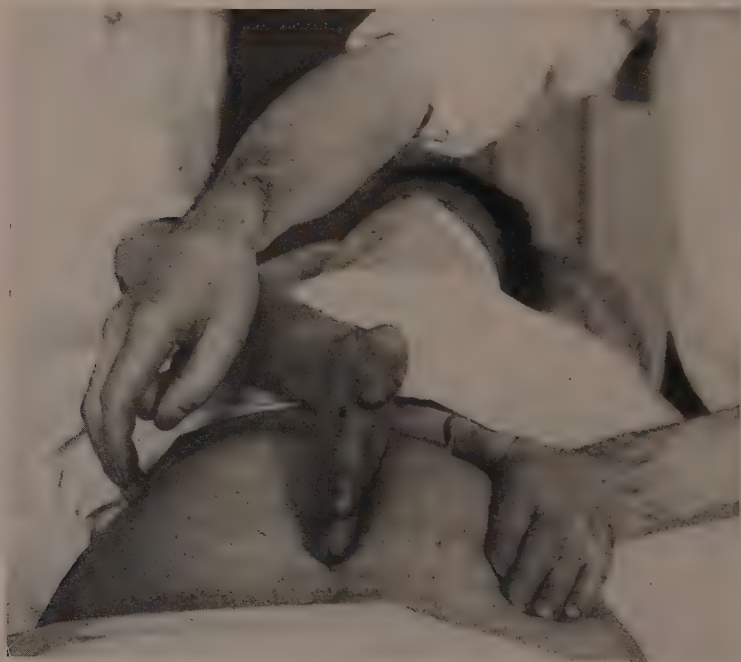
Fig. 26.—Differentiating fat wave from fluid wave by manual pressure in median line. (Crossen—*Diseases of Women.*)

Percussion will map out dull or tympanitic areas and will distinguish the relative tympanitic note of the different portions of the alimentary tract. It confirms or modifies the data obtained by inspection and palpation. It will reveal the shape and extent of swellings and collections of fluid. By changing the position of the patient one can ascertain whether fluid is free in the cavity or confined in

cysts. The fetal parts may be defined and therefore the presentation and position of the fetus estimated by palpation, assisted by percussion.

Auscultation is of chief use in detecting the position of the fetal heart tones and their rate. It also gives some information as to friction sounds, souffles, and intestinal gaseous noises.
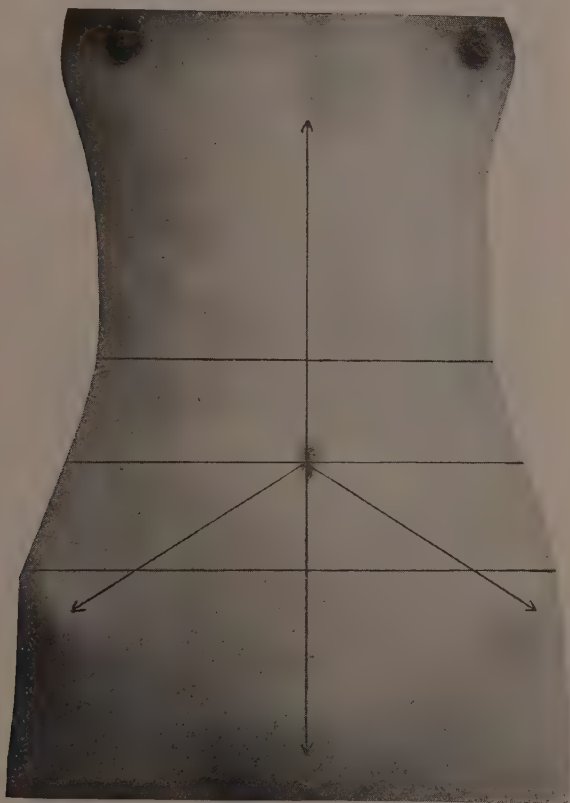
Fig. 27.—Lines for abdominal mensuration. (Crossen—*Diseases of Women.*)

Mensuration with the tape-measure or pelvimeter will tell the extent of abdominal distention, the extent of its irregularity and the distance apart or from landmarks of points of interest. It is often valuable, when employing either palpation or mensuration, to mark boundaries with an eyebrow pencil or other marker.
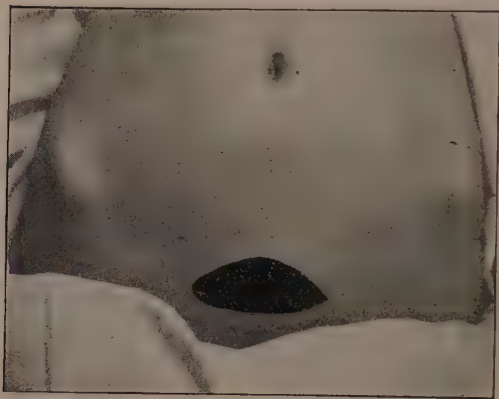
Fig. 28.—Area of dullness in moderate distention of bladder. (Crossen—*Diseases of Women.*)

Fig. 29.—Area of dullness in pregnancy or uterine tumor. (Crossen—*Diseases of Women.*)

DIFFERENTIATION OF ABDOMINAL SWELLINGS

Pregnancy must always be borne in mind when examining a woman. It must always be ruled out by rigid evidence, as well from
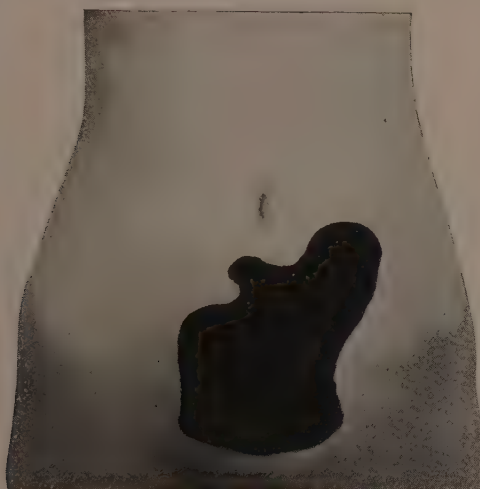
Fig. 30.—Irregular area of dullness in uterine myoma. (Crossen—*Diseases of Women.*)
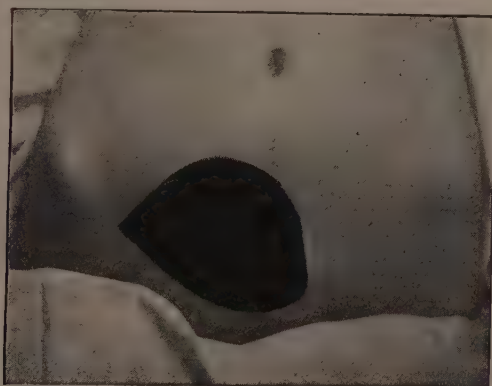
Fig. 31.—Area of dullness due to mass in tuboovarian region. (Crossen—*Diseases of Women.*)

the physical findings as from the anamnesis. In early pregnancy, before the uterine tumor itself is of sufficient size to be noted on abdominal examination, the abdomen will nevertheless be distended by

gas due to the digestive disturbances always present during the first months. As the uterus rises into the abdomen it will be felt as a smooth rounded swelling mostly in the median line, progressively extending, with the advance of gestation, upwards and to each side until at last it nearly fills the abdominal cavity. After the sixth month, sometimes earlier, the fetal parts can be felt, the fetal heart tones
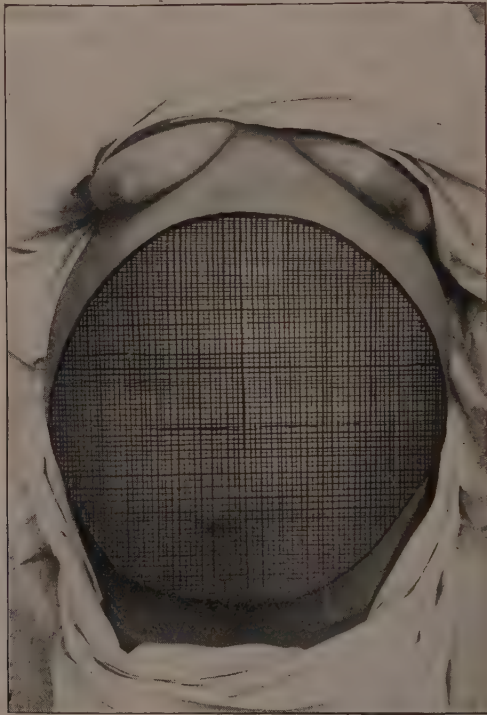
Fig. 32.—Area of dullness in large ovarian cyst or full-term pregnancy. (Crossen—
Diseases of Women.)

heard, and the fetal motions perceived by both inspection and palpation.

Tumors of any organ of the abdomen, of liver, spleen, stomach, intestine, mesentery, omentum, kidney, abdominal wall, pancreas, retroperitoneal space or vessels will be observed in the customary locality or extending from the organ involved into wider regions.

Tumors of the pelvic organs will be found to have origin within the pelvic cavity or the history will show that such was the origin.

Tumors of the uterus, except subperitoneal fibroids, are usually regular in outline. Such a tumor may indicate gestation, subinvolution, metritis, pyometra (pus in the uterus), hematometra (blood in the uterus), lochiometra (retention of lochia within uterine cavity), physometra (gas in the uterus) and submucous or interstitial fibroids. Uterine tumors of irregular outline may be fibroids irregularly placed, pedunculated subperitoneal fibroids, sarcoma or carcinoma of the body, and uterine malformations. The uterine tumor usually grows upwards mainly in the median line of the body.
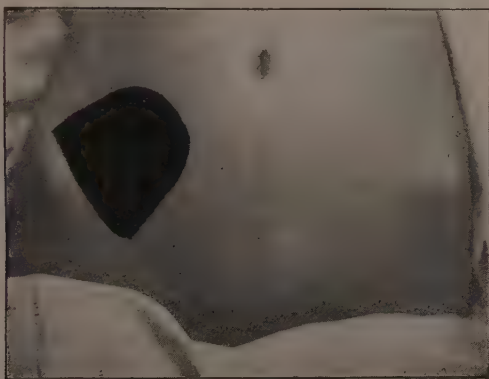
Fig. 33.—Area of dullness due to mass in region of appendix. (Crossen—*Diseases of Women.*)

Ovarian tumors may be cystic or solid. They usually start growing from one side of the pelvis, but by the time they reach the abdomen they are usually well within the general median line of the body. The cystic tumor may be unilocular, in which case it will have a regular rounded surface and will usually give fluctuation. Percussion will remain about the same whatever the position of the patient.

Embryomata or dermoid tumors of the ovary are of a semisolid consistency and may give no fluctuation. They rarely are larger than a full-term fetal head and they grow slowly. Sometimes bony plates may be palpated.

The **multilocular ovarian cysts** have an irregular outline and a different consistency in different parts, rarely showing fluctuation but

sometimes giving a sort of fremitus. They are apt to be large and to be accompanied by ascites. The papillomatous cysts may contain enough fluid to give fluctuation waves or may be semisolid, depending upon the extent of the papillomatous growths within them. They are usually accompanied by ascites and, when the cysts have burst and allowed the papillomatous masses to grow into the abdominal cavity and to become attached to various places within it, they may

Fig. 34.—Showing the area of dullness in moderate ascites, with the patient lying on her back. (Crossen—*Diseases of Women.*)

cause the existence of many irregular semisolid tumors in various locations.

The **solid tumors** of the ovary are seldom large enough to be palpable through the abdominal walls except with the help of internal examination. They are rare and comprise fibromata, sarcomata or carcinomata. Carcinomata are apt to occur in both ovaries. With malignant disease of the ovaries ascites usually coexists, often accompanied by considerable blood within the peritoneal cavity.

Tubal swellings are usually not large enough to be felt through

the abdominal wall. Sometimes pyosalpinx, hydrosalpinx (watery fluid in the tube), hematosalpinx, or tubal pregnancy may extend into the abdomen far enough to be palpated. It is impossible to diagnosticate them without bimanual examination.

Other pelvic tumors are adhesions, matting tubes, ovaries, uterus, omentum and often masses of intestine together; effusions of blood, serum, lymph, pus, etc., tuboovarian cysts; parovarian tumors. With the exception of the last they are seldom diagnosticated through the abdominal wall. Parovarian tumors, usually cysts developing from
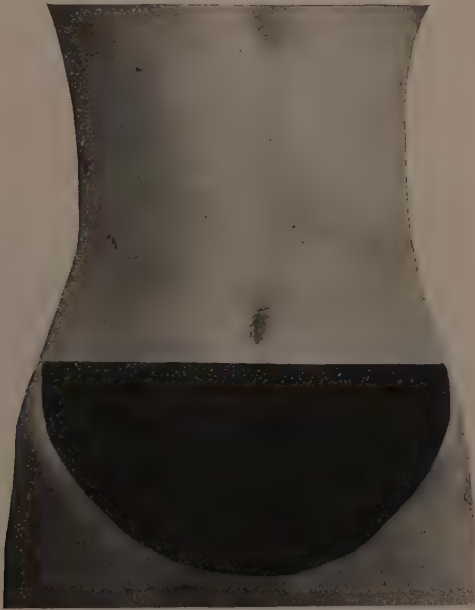
Fig. 35.—Showing the area of dullness in moderate ascites, with the patient standing. (Crossen—*Diseases of Women.*)

the rudimentary tubules of the parovarium, may become large enough to be perceptible from above. They grow within the folds of the broad ligament and resemble ovarian cysts except that they usually do not have such an evident pedicle.

Ascites, accumulation of fluid within the abdomen, shows dullness in the flanks when the patient lies on the back, changing to the dependent portion when she turns on the side. With the patient on her back, tympanitic resonance due to the intestines is found in the
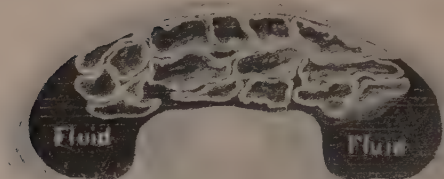
Fig. 36.—Showing the reason for the disposition of the dull and resonant areas in moderate ascites.   (Butler—*Diagnostics of Internal Medicine.*)

Fig. 37.—Indicating the relation of the dull and resonant areas in the case of a tumor in central lower abdomen.   (Butler—*Diagnostics of Internal Medicine.*)

Fig. 38.—Ascites.   Representing the patient turned on one side.   The fluid gravitates to the under side, leaving the upper flank resonant.   (Butler—*Diagnostics of Internal Medicine.*)

middle of the abdomen around the navel with dullness in the lumbar and inguinal regions. When the swelling is due to pregnancy or to other cause of enlargement of the uterus, the dullness will be found extending upwards from the pubes and occupying the hypogastric, inguinal, and umbilical regions, or higher, according to the extent of the uterine enlargement.

Fig. 39.—Kitchen table prepared for gynecological examination. (Crossen—*Diseases of Women.*)

Vulvovaginal Examination

Proper preparations must be made for the vulvovaginal examinations. A suitable table or gynecological chair provided with stirrups for the heels is almost essential. In default of such provision

shift may be made with a couch or ordinary bed. The patient should
be prepared, at least to the extent of having the bladder and rectum
emptied and the closely fitting portions of her attire removed or
loosened. The patient should recline on the back with the head and
shoulders elevated on a pillow, the knees and thighs flexed and, if

Fig. 40.—Patient prepared for bimanual examination. (Crossen—*Diseases of Women.*)

possible, the heels in a pair of stirrups. A sheet should be thrown
over the body and legs, and this should be pushed up into a fold be-
tween the thighs in such a manner that the legs are covered and the
vulvar region only is exposed.

Inspection, which requires a good light, reveals the condition of the skin of the labia and surrounding parts. There may be evidences of irritation or of eczematous eruption, perhaps caused by the discharges from the vagina. Scratches may indicate itching, the cause of which must be investigated. Evidences of masturbation, such as redness or slight excoriations, may appear. A discharge may show; blood, pus, mucus, serum, sebum, etc., with or without odor.

Separating with thumb and finger the labia majora, a view of the vestibule is obtained. Disease and anomalies of the clitoris, the urethral orifice, the labia minora, the fourchette, perineum, and vaginal orifice will be noted if present.

Digital examination is next to be employed. Having already separated the lips of the vulva, one passes the index finger of the other hand into the vaginal orifice. The laxity or tenseness of the vaginal walls and perineum is felt. With the thumb and finger, the glands of Bartholin are palpated. It is always safest, both to patient and physician, to make the examination with the hands covered with rubber gloves. Thus protected the physician need not fear even the foulest discharges and the patient has the assurance that no infection is entering her body from some former patient. If the gloves are not already sterilized, they can be washed in alcohol and other antiseptics after being put on. A good lubricant for gloves is sterilized glycerine or some of the glycerine jellies which are furnished by the pharmacists in collapsible tubes.

Bimanual examination is the continuation of the digital examination. The internal examining finger (one finger is enough but some prefer to introduce two) is passed along the course of the vagina and the fingers of the other hand are pressed gently but firmly upon the surface of the abdomen just above the pubes. The function of the external hand is to press downwards the pelvic viscera upon the internal finger and to help palpate the organs between the two hands. The internal finger reveals to the touch the condition of the vagina and the portio vaginalis of the cervix uteri as to size, laxity, tumors, ulcerations, scars, or foreign bodies. The base of the bladder can also be palpated.

The internal finger reaches the cervix and holds the uterus between itself and the external hand, thus noting the size, consistency, shape, sensitiveness, motility, and position of the uterus. Passing the tips

of the outer and inner fingers to one side of the uterus, one can feel between them the ovaries, the tubes and the broad ligaments. Normal ovaries may be distinguished in persons who are not fat, but the other structures will seldom be palpable except when enlarged. Behind the uterus the pouch of Douglas may be felt if it contains any abnormal body, such as prolapsed tube or ovary, or the fundus of the retroflexed uterus. Masses of organs matted together by adhesions will be felt, usually posterior to the uterus, but often lying more to one side than the other.
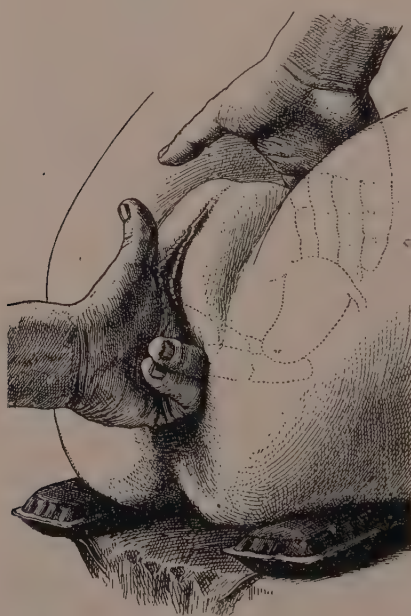
Fig. 41.—Bimanual examination, showing disposition of outside fingers and left thumb. (Kelly—*Operative Gynecology*.)

Fig. 42.—Showing the other disposition of third and fourth fingers along gluteal crease. (Kelly—*Operative Gynecology*.)

One must not be deceived by a distended bladder, sigmoid, or rectum into believing in the existence of tumors or displaced organs. If in doubt, have the patient come again or see that the bladder and bowels are emptied. Stones and tumors of the bladder can sometimes be palpated bimanually. Vesical tenderness may reveal cystitis. One must be on one's guard about *interpreting supposed tenderness* in any region. Some women, especially young or highly nervous women,

complain of great tenderness in all parts. Tenderness alone, without palpation of some definite mass, can not be given much diagnostic value.

In virgins and in some other women the *rectoabdominal bimanual examination* may be substituted for the vaginoabdominal. The findings are practically similar. One can, however, reach farther upwards into the posterior part of the pelvis by the rectal method. The rectal digital examination is useful in obstetrical examinations because

Fig. 43.—Palpating the margin of the uterus to determine enlargement or irregularity. (Edgar—*Practice of Obstetrics.*)

Fig. 44.—Estimating the width of the uterus by separating the fingers so that one goes to each side of the uterus. (Edgar—*Practice of Obstetrics.*)

it avoids danger of infection of the parturient tract. By practice one will become almost as proficient in it as in the ordinary method per vaginam.

Bimanual examination under anesthesia may be necessary in the cases of highly nervous women or in those cases where there is so much pain and tenderness that the abdominal walls are held so rigid that the bimanual examination is useless without anesthesia. All the abdominal muscles are relaxed and all the rigidity due to pain is eliminated. Often the clinical picture is so much clearer that the anesthetic is well worth while. One should usually, previous to a

laparotomy, examine bimanually while the patient is anesthetized. A diagnosis based upon the examination made during consciousness may be considerably revised.

Instrumental Examination

The number and variety of instruments used for diagnostic purposes in gynecology are practically endless, many are of little value, and many are dangerous. The more expert one becomes in palpation and in bimanual examination, the less he will require instruments.

The **speculum** is an instrument devised to open up external orifices of the body so that the inside may be seen. Vaginal specula are of various types. The tubal or Ferguson speculum is a round tube of mirrored glass, having the external end flared and the internal end cut off at an angle. It gives a view of the vaginal canal as it passes in, and of the cervix and external os uteri when it is fully passed. It is rarely used by progressive gynecologists now. The double spatular or *Sims speculum* is seldom used now because it requires the rather complicated and difficult ''Sims' position'' of the patient. The single spatular or *Simon speculum* is often used in vaginal operations as a vaginal retractor and enables one to see something of the vaginal vault and portio vaginalis of the cervix, especially when the latter is pulled down by a vulsella.

The *bivalve* is the most useful vaginal speculum. It is made in many forms but consists essentially of two blades with their concavities towards each other, joined at the handle end by a hinge. The most convenient form has the handles applied at one side so that they do not interfere with view when the instrument is introduced and opened. The anterior blade is shorter than the posterior one so that it will pass in front of the cervix, while the posterior blade passes into the posterior vault of the vagina. The instrument reveals the vaginal walls, the external os, and the portio vaginalis. Except for the color and for the discharges, little is learned by the vaginal speculum beyond what a skillful bimanual examination will reveal. The bivalve speculum is useful in minor local therapeutic measures and in certain minor operations.

The *rectal speculum*, bivalve or trivalve, is sometimes used in investigating rectal complications of gynecological troubles.

The uterine speculum is named to be condemned.
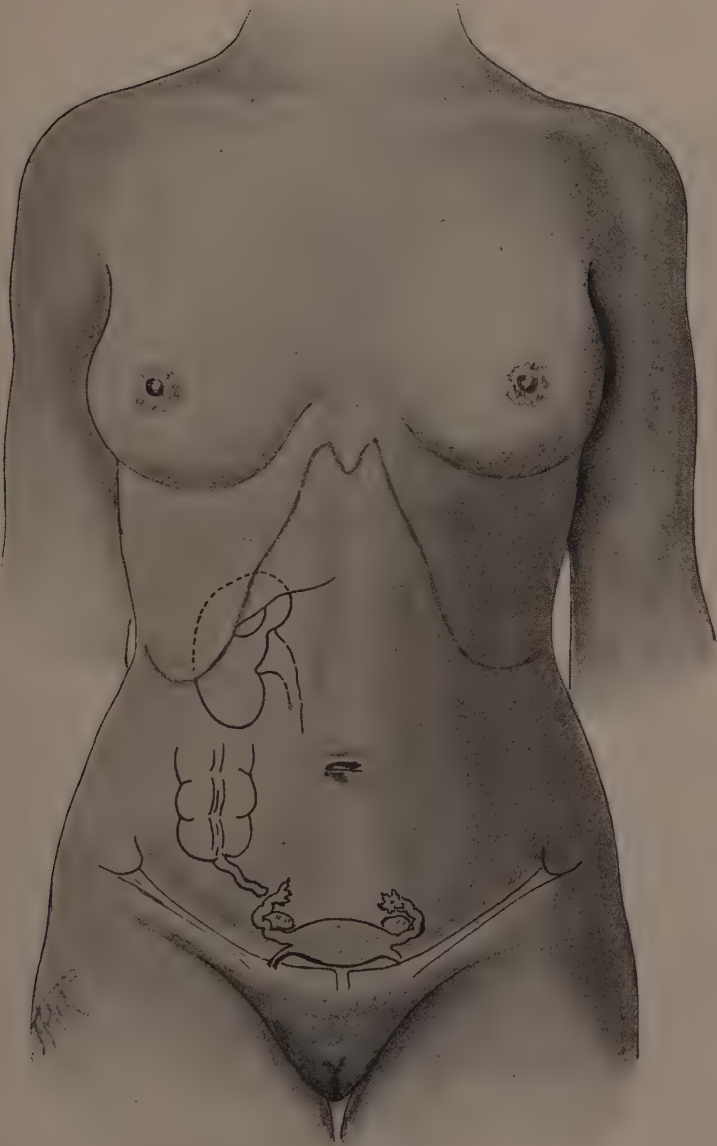
Fig. 45.—Showing close relation of liver, gall bladder, kidney, cecum, appendix, tubes and ovaries. (Redrawn from Kelly—*Operative Gynecology*.)

The **cystoscope** is an instrument for exploration of the bladder and incidentally of the urethra. The *Pawlik cystoscope* is a metal tube about five inches long and in diameter about as great as a larger male
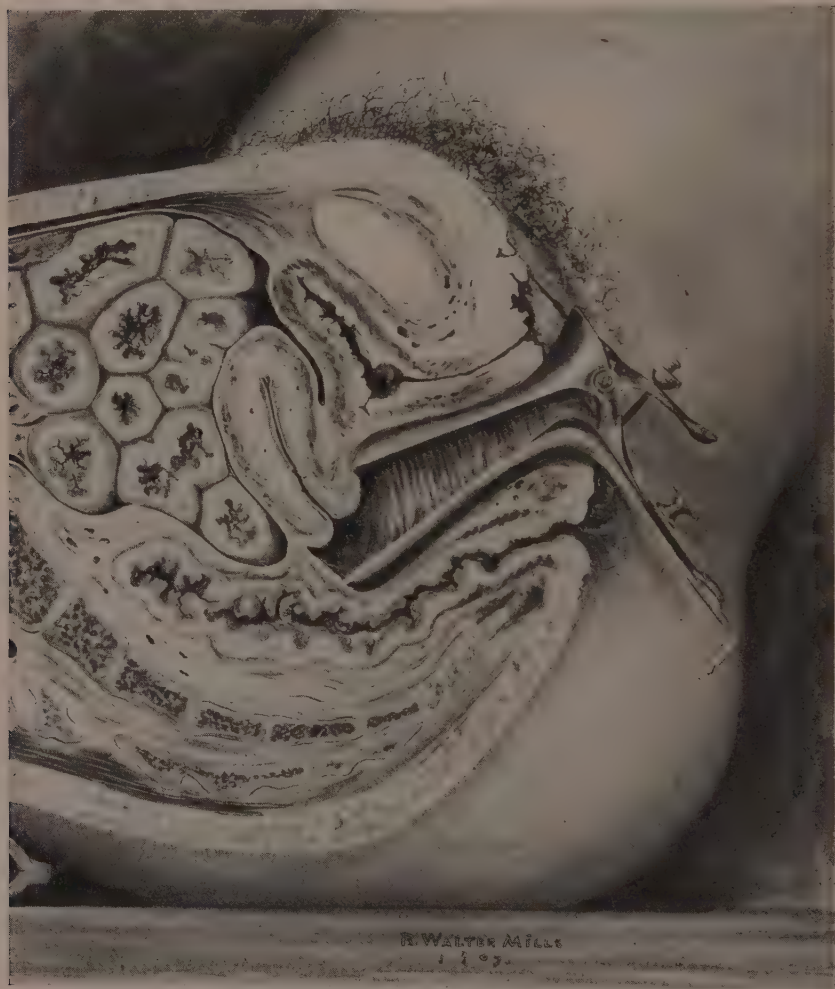
Fig. 46.—Anteroposterior section showing relation of speculum and parts. (Crossen— *Diseases of Women.*)

urethral sound, with a handle off at an angle. The patient is placed in the knee-chest posture or in the exaggerated lithotomy posture, preferably under anesthesia. In the knee-chest posture the patient is

supported with the knees and the front of the chest on the table and the thighs vertical. In the lithotomy posture she lies on her back with her legs held up by assistants, or in slings. The exaggeration is attained by having the buttocks supported by firm cushions or several layers of folded blankets. The tube is passed into the bladder, light is thrown into it from a head mirror, the air fills the bladder cavity and its walls are explored by moving the end of the instrument about. The ureters may be found and catheterized.

The *Nitze instrument* depends upon a set of prisms and lenses set in a long metal tube somewhat resembling a male sound. The instrument is not hollow, therefore the bladder must previously be filled with sterile water. A small electric light in the internal end illuminates a portion at a time of the bladder wall and the image is reflected to the eye applied at the outer end. The ureters can be catheterized through this instrument by means of a special attachment. The
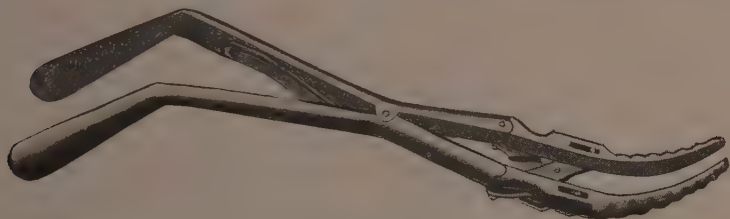
Fig. 47.—Goodell uterine dilator.

Pawlik cystoscope is adapted only to the female bladder, the Nitze to either male or female. The latter is superseding the former.

The **uterine sound** is an instrument happily passing into disuse. It is essentially a long metal probe and is intended to explore the interior of the uterus. It is a dangerous instrument, both from the likelihood of carrying infectious matter into the uterine cavity and from the danger of interrupting a possible pregnancy. Little can be learned from it that can not better be learned from bimanual examination.

Uterine dilators are of three general kinds: the sound dilator (Hegar type), the expanding dilator (Goodell type), and the tent. Their use is an operative procedure and demands operative asepsis and preparation. As diagnostic instruments their only excusable use is to prepare the way for curettage of the uterine mucous membrane so that the scrapings may be subjected to the microscope. The tent depends upon the absorption of fluid by a porous material and conse-

quent expansion within the cervical canal and dilatation thereby. Tents have almost gone out of use among scientific practitioners.

The **vulsella** (spelled in many ways) is made like a catch forceps with one or two hooks at the distal end instead of the compressors. It is used to draw down the uterus and to hold it while dilator or curette is being employed. It is also useful in many operations when something must be firmly held temporarily.
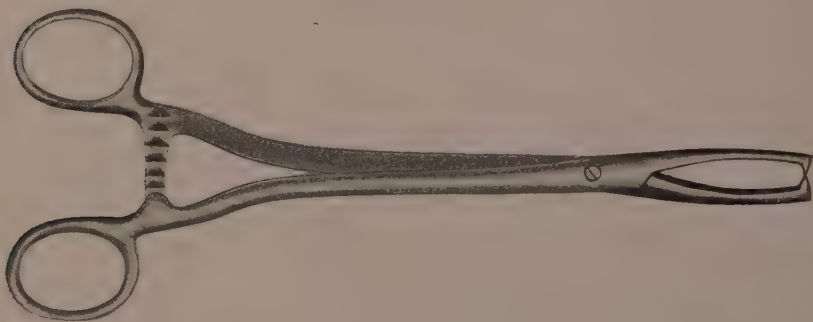
Fig. 48.—Jacobs' vulsella.

The **curette** is in the form of a small spoon or loop at the end of a long handle. It is intended for the purpose of removing tissue or contents from the uterine cavity. The dull curette is for removing remnants of the products of gestation and the sharp curette for scraping away portions or all of the uterine mucous membrane. The use of the curette involves an operation with all the precautions implied and must be preceded by dilatation of the cervical canal in some

Fig. 49.—Sims' curette.

manner. The sound may safely be used as a preliminary to the introduction of the dilator so as to test the direction and depth of the uterine cavity.

The **uterine syringe** is seldom justifiably used to obtain a sample of the contents of the uterus. The hollow needle and syringe may sometimes be justified to confirm diagnosis of an abscess or of a cyst point-

ing in the vaginal vault. It should only be employed with aseptic precautions and when one is prepared to go on with the operation which may be indicated.

The **microscope** in gynecology, as in all branches of medicine, is an invaluable adjunct to diagnosis. Its consideration here is superfluous, as is that of chemical, biological, and other experimental procedures. Serum tests, bacteriological tests, therapeutic tests, biological reactions, animal experimentation, and the x-ray are treated in other special works.

CHAPTER IV

ASEPSIS IN GYNECOLOGY

Asepsis means the absence of bacterial poisoning from the patient. It is the prophylactic against septic infection of the patient. More or less complete asepsis may be acquired in very many ways and the literature is full of the various personal methods of countless authorities, but the general principles involved are the same in all.

Practically asepsis consists in the removal of all possible microbes and the killing of the rest. The killing is accomplished by *antisepsis*, that is, the use of materials and of forces like chemicals, heat, sunlight and atmospheric oxygen. Those measures which aim to increase the bodily resistance to bacterial action are included under the head of *immunity* and hardly belong to the subject matter of this chapter.

It is now generally accepted that bacteria which have already obtained entrance to a wound can not be destroyed within the wound by antiseptic measures. Therefore our efforts to attain asepsis are confined to attempts to prevent the initial infection of wounds and to guard them from infection after they have been made.

Our efforts to accomplish asepsis may be divided as follows: disinfection of the hands of operator and assistants; disinfection of the skin of the patient in the neighborhood of the operation; disinfection of instruments and apparatus employed in operation or in dressing; prevention of infection from the air.

DISINFECTION OF THE HANDS

Prophylaxis in hand disinfection means the prevention of contamination of the skin of the hands by septic microorganisms. The hands will continually be subjected to the danger of infection during the ordinary occupations and daily duties, but it is possible to keep them relatively clean by exercising proper precautions. The surgeon or gynecologist who may be called upon often to perform operations must keep his hands in as good condition as he can. Roughness, hardness, accumulations of dirt, cracks, small wounds, chapping and the like

will render the hands very difficult to clean thoroughly. The softer and smoother they are kept the easier they are to disinfect and the less likely they are to become seriously infected.

One must avoid hard manual work, exposure to cold, exposure to cold water or to irritating solutions, exposure to knocks and minute abrasions, and especially exposure of the hands to filth. One should not perform autopsies or do vaginal examinations, operations or dressings in pus cases without gloves. One should not do gardening, carpentering, painting or other such labor without protecting the hands from injury by suitable gloves.

In cold weather one should wear thick enough gloves, should not allow his hands to remain in cold water, and should dry them thoroughly after wetting. During the season when the skin is liable to chap, one who practices gynecology or surgery should rub bland emollients into his hands at night. While the nails should be carefully kept in order, it is not wise to have the hands manicured by the ordinary professional manicurist. The little wounds which these operators often inflict may easily become infected by the manicure tools or later by contact with other objects.

Washing is first performed with ordinary soap and warm water to remove the gross dirt. From five to fifteen minutes should be spent in scrubbing the hands, finger by finger, joint by joint, nail by nail, with soft soap and a soft brush in running water. To wash the hands in a basin may remove the dirt but the hands at the last are immersed in a general solution of all the dirt. Running water is practically a necessity for complete asepsis. One can not economize soap. One should scrub and rinse, scrub and rinse, continually. A soft wooden stick such as manicurists use, should be used to clean the subungual spaces and the spaces about the nails. After the final rinsing in the running warm water the hands are ready for the antiseptic solutions.

Disinfectants

The number and variety of chemicals for disinfection are legion. Too great strength of solutions defeats the object, because it causes cracking and chapping and exfoliation of the skin and makes the next disinfection more difficult. The following procedure is recommended: The hands are rinsed in a basin of warm sterile water; then in a basin of alcohol, 70 per cent, or alcohol may be poured on them

from a bottle; then they are rinsed in a basin of bichloride of mercury solution, 1-1000 or 1-2000; last in a basin of sterile water again. The hands are then dried on a sterile towel. One is now ready to don his sterile operating gown and rubber gloves.

Gloves

Operating gloves are now used by the great majority of operators. They have advantages and disadvantages. The *disadvantages* are slight interference with sense of touch, maceration of cuticle, cost, and danger of being pricked or torn. The *advantages* are perfect asepsis when intact, and the ease of rendering them aseptic again if they should come in contact with septic material. In addition, it is a source of great relief to an operator who must work with unknown assistants to know that their hands at least are covered by aseptic material.

The disadvantages are more apparent than real. Interference with the sense of touch is so slight that practiced operators are not handicapped. The cost is not great, provided care is taken of the gloves after operations and in the intervals between operations. They should be carefully dried, powdered with talcum, and laid away in folds of soft gauze.

There are two methods of sterilization. The gloves may be dried, rolled in pairs, and sterilized in the autoclave with gauze and bandages. They may be boiled with the instruments before the operation.

There is a knack in *putting gloves off and on* which is a factor in their preservation. The dried hands are rubbed with sterile talcum powder, and thrust into the gloves in the ordinary way. If they are of the proper size for the individual, they will slip on without trouble. A less easy method is the wet method. The hands are wet in sterile water (alcohol is better) and the gloves are partly filled with the sterile fluid and then the hands are thrust into the gloves. In taking rubber gloves off it is well to lift up the wrists and allow water to enter before pulling them off by inversion.

If gloves become contaminated during the operation by pus or otherwise they can be safely cleaned again by rinsing in a little alcohol, 70 per cent, followed by rinsing in sterile water. Inoculation experiments show that gloves so treated are sterile, provided that they are uninjured. If a glove becomes punctured during an operation it should be changed as soon as possible. In managing a private obstetric

case, where one has scanty assistance, the use of rubber gloves will enable the obstetrician to handle furniture and apparatus with impunity, provided that each time before touching the patient, he carefully washes his gloved hands in alcohol and then sterile water. The smooth surface of the rubber glove permits the attainment of asepsis whereas such would be impossible with the rough surface of the hand itself. In an emergency, when neither one's gloves nor hands can be previously sterilized, it will be sufficient to put on the dry gloves and then rinse them thoroughly with alcohol and sterile water.

DISINFECTION OF THE PATIENT

General preparation of the patient includes the care before operation which will be considered under another heading. For the sake of asepsis, the *bowels* should be as nearly empty as possible, both by previous fasting and by the use of moderate laxatives and enemas. The presence of decaying matter within the intestinal canal, or of dead matter left behind in the abdominal cavity, by means of the migration of bacteria through the intestinal walls, notably the bacillus coli communis, tends towards infection of the peritoneum. This germ is capable of a wonderful increase in its virulence under the influence of changing environment and food supply.

The *skin* of the whole body should be bathed, the mouth, teeth, and the nasopharyngeal cavities should be cleansed and the hairs of the abdomen and pubes should be shaved.

Disinfection of the skin of the patient is accomplished in much the same way as that of the operator's hands. If possible, the night before the operation, the skin of the operative region should be scrubbed gently with soft soap and warm water for several minutes, with especial care for the folds and for the navel. For an abdominal operation of any sort the preparation should take in the whole abdomen and should extend some distance upwards upon the chest, sideways upon the flanks, and downwards upon the thighs. Fluids should be gently poured upon the surface and the scrubbing should be done with gauze or with very soft brushes. The shaving should be done carefully. It is bad to inflict wounds, even of very minute extent, upon skin in the region of an operation because these greatly increase the chances of infection.

After scrubbing with soap and water, the area is to be rinsed with

sterile water, then with alcohol, 70 per cent, then with bichloride of mercury solution, 1-1000, and lastly with sterile water. After drying with sterile gauze, a sterile dry dressing should be bound on and left until the time of operation. With such preparation beforehand, the patient may at once be placed under the anesthetic. As soon as she is asleep the dressing may be removed and the abdomen may be painted with tincture of iodine, which soon dries. Iodine should be used only when the skin is perfectly dry, therefore it is unwise to use it directly after going through the other parts of the preparation described. It is well to wash off the iodine with alcohol. Perhaps the value of the iodine lies in the alcoholic content.

If the operation is to be by the vaginal route and it is certain that there will be no abdominal incision required, the scrubbing and other preparation may be limited to the vaginal canal, the vulva, the perineum, and some distance upon the pubes and upon the thighs and buttocks. The vaginal canal should be cleansed by means of small pieces of gauze on long dressing forceps, first with soap and water, next with sterile water, next with alcohol and lastly with sterile water. Since it is difficult or impossible to insure the aseptic closure of the external genitals, it is useless to prepare vaginally long before the operation. Since the vaginal preparation is disagreeable and often painful, it is often best to defer it until the patient is asleep or almost asleep.

Protection of the patient's body against infecting the instruments, apparatus or hands of the operator and assistants is accomplished by draping it with sterile towels and sheets. The exact method of draping and the exact number of towels and sheets required need not be detailed. It is sufficient to state that there should be enough to completely cover the patient's body, so that contact with it shall not imperil the asepsis of the operation.

It is customary to lay four towels around the region of the proposed incision, fastened together with clamps or pins so that a small slit appears between them. Over these is laid a sheet, covering the whole body, provided with an opening towards the middle where the wound will come.

In vaginal operations the best apparatus consists of a sheet with a slit in it to correspond to the vulvar cleft and provided with leggings.

With the addition of a few towels the operative area can be well shut off.

The means may differ; the end is to protect the operator and assistants from contaminating themselves or their apparatus by contact with an uncovered part of the patient, her clothing, or the table. Therefore enough sterile coverings must be used.

DISINFECTION OF INSTRUMENTS AND APPARATUS

Disinfection of instruments is safest by means of *heat*. Boiling for twenty minutes in a solution of one per cent sodium carbonate is usually enough. It is assumed, however, that the instruments have been previously cleaned by washing and scrubbing so that no blood, pus, or oily material remains upon them. The safest instruments are those which admit of disjointing and which are of the simplest construction.

The *fewer instruments* one uses the better. An operator should accustom himself to operate with few and simple instruments instead of becoming a slave to many and complicated tools. The workman does the work, the tools are secondary. ''Das Messer schneidet nicht, Sie schneiden.'' (Oesterreich.)

Since the edge of a knife is somewhat injured by boiling, some operators sterilize them by immersion in 95 per cent *carbolic acid*. Unless great care is taken to remove the carbolic acid by means of alcohol, there is much danger of injury to the tissues of the patient by some of the strong phenol which may be left upon the instrument. Carbolic acid is a dangerous drug at best. Sterilization of instruments in a vapor of *formaldehyde* gas is employed by some operators. It is good when efficient, but is uncertain with most forms of apparatus.

Disinfection of suture material is of immense importance. Silk, linen and silkworm gut may be boiled. Catgut requires careful and painstaking preparation, which the practitioner himself can very seldom afford to give. Hospitals often sterilize their own catgut by methods of their own which can not be detailed here. For the operator, it is better to rely upon what is prepared by his own hospital, or best of all, to buy his catgut from some reliable manufacturer. Fortunately there are many such manufacturers upon whom one can implicitly rely.

It is best to use a catgut which will admit of being boiled within its

glass containers at the time of the operation. As needed each tube is held between gauze and broken. The contents are ready for use. Some catgut comes in envelopes instead of in glass tubes. The outer envelop may be opened by anybody and the inner covering dropped upon a sterile towel to be picked up by some sterile assistant. It must be remembered that sterile suture material will not remain so if it becomes infected either before entrance into the wound or afterwards.

Disinfection of apparatus used in the operation must be as complete as that of the hands, skin, instruments, or sutures. All gauze used for dressings, sponges, pads, or otherwise must be sterilized in

Fig. 50.—Wash boiler used as sterilizer.

small packages of each kind. In hospitals provided with a steam sterilizer, bundles of gauze and cotton, of pads and bandages, as well as the towels, sheets, gowns, etc., are prepared in quantities beforehand. It is well for an operator to have access to such a hospital and obtain his sterile material from it when possible. With the multiplication of small hospitals even in rural communities this course is becoming easier.

One may obtain from the manufacturers nearly all these things already prepared and perfectly trustworthy, but the expense is great. It is possible at home to sterilize packages of sponges and other things made of gauze and cotton by means of steam. The gauze, in proper shape and in definite number of pieces, is made up in bundles covered with cotton flannel and fastened with safety pins. A wash boiler is

fitted with a wire rack which stands upon legs about four inches above the bottom. Water is put in to the level of three inches and the bundles are laid upon the rack. The bundles may be hung above the surface of the water in a cloth hammock fastened by cords to the handles of the boiler. The cover is fastened with wire fasteners and a vent hole is provided in it. The water is brought to a boil and allowed to continue boiling for twenty minutes. It is safer to go through this process again the next day. If the bundles are taken out while the water is still boiling, they will not be wet. Towels and sheets may be sterilized in this manner.

DISINFECTION OF THE AIR

Disinfection of the air was thought by Lister and the earlier workers in the field of antisepsis to be the main factor in prevention of infection of wounds. It is now known that the danger of infecting wounds from the air during operations, while present, is very small.

Air is more dangerous the more it contains *dust*. It is essential that the room in which the operation is to be performed shall be free from dust particles. Therefore operating rooms in hospitals are made with smooth walls, smooth hard floors, rounded corners, simple door jambs and window ledges. Only the furniture absolutely necessary should be in an operating room. It is best to have everything made of enameled metal and so simple in construction that it shall be as smooth as possible throughout.

If it becomes necessary to operate in a private room and there is plenty of time, all hangings, extra furniture, etc., should be removed, carpets taken up, woodwork, floors, and walls wiped with damp cloths, chandeliers and projecting things covered with sheets. Since all this stirs up much dust, it is wrong to do it when there is not an interval before the operation of twelve or more hours to allow dust to settle. Otherwise it is better to cover furniture and other things with sheets, and place sheets on the floor over the carpet.

From the *mouths or noses* of the operator, his assistants, nurses, and bystanders, may fly minute drops of fluid which may be a source of danger. This is especially likely if there is much talking, sneezing, coughing, or laughing. The operator and his assistants, who hover over the operative field, should have their mouths and noses protected by some sort of mask made of gauze or cloth. Particles of dandruff

or dust may fall from the hair or whiskers of the operator or his assistants and endanger the wound. The scalp must be covered by some sort of cap. The beard should be closely trimmed or shaven. If the operator should perspire, his face must be kept wiped clear of sweat by some attendant or nurse.

Bystanders should be encouraged to keep their mouths shut and their hands out of the way. In Olshausen's clinic in Berlin, there used to be a sign, ''Noli tangere, favete linguis.'' It is well to provide for visitors at surgical and gynecological clinics gowns made like ponchos, without sleeves or armholes. In an amphitheater clinic there is danger from stirring up of dust, if students move about.

CHAPTER V

CARE OF THE PATIENT BEFORE AND AFTER OPERATION

CARE BEFORE OPERATION

In the discussion of *asepsis,* most of the subject of care before operation has been considered.

Some authors recommend a rather long *period of preparation* of the patient before she undergoes her operation, even advising preliminary treatment in the hospital for more than a week. Such procedure is rarely wise. In most cases it is the disease demanding operation which is making the patient ill and usually the sooner she is relieved of that by the operation the sooner she will begin convalescence. The mental and nervous state of a woman who is shut up in a hospital waiting to be prepared for operation resembles somewhat that of one waiting to be hanged. The longer she waits the more the terrors of the coming ordeal are magnified.

If the woman is anemic to a marked degree, say that she has a hemoglobin percentage under forty-five, and the anemia is not directly due to the disorder for which she contemplates operation, she may be put to bed and fed up for a time until the hemoglobin rises to a safe percentage. Such cases are sometimes observed with bleeding fibroids. Sometimes rest in bed and tamponade of the cervix will allow the woman to recover herself so that it will be safe to operate. In tuberculosis of the female genitals operation is rarely indicated at all, unless the symptoms are directly dependent upon the local lesion. In such cases the operation is usually imperative.

If a woman *is suffering from some other disease* besides that for which operation is advised, of course she should wait until she has recovered or improved from that before undergoing operation, unless imperatively indicated to save life. It would be unwise to perform a myomectomy, for instance, upon a woman suffering from malaria, typhoid, or pneumonia. During pregnancy and during lactation one should postpone any operation which is not urgent.

In certain cases of infection of the pelvis when there is active in-

flammation with elevated temperature and great tenderness, pre-
liminary treatment of a local character, combined with rest, diet, and
laxatives, would be safer than immediate radical operation. Indeed,
nowadays, one does not operate in the presence of acute infection,
except to open actual abscesses, or when the intestinal canal is in-
volved.

When there are *ulcerated or infected patches* on the skin of the
abdomen, only emergency would justify laparotomy before the infec-
tion had been removed, either by excision or healing of the infected
areas. The same principle applies to ulcerating places in the vulva or
vagina when one considers operation by the vaginal route.

It is seldom proper to operate in a supposedly clean area *when infec-
tion is present in some other* part of the body. In the presence of acute
gonorrhea, tonsillitis, bronchitis, osteomyelitis, ulceration of the skin,
middle ear disease, or other similar infectious areas elsewhere in the
body, it is unwise to perform any operation of election because of the
danger of infecting the operative region by microbes which may be
free in the blood stream. Unless there is emergency, the gynecologist
should wait until the acute infection has subsided.

When there is no contraindication to operation and it has been
determined that the patient's interests require an operation, there
should be *no unnecessary delay.* It is well for the woman to enter
the hospital at least a day before the time set for the operation for the
preparation which is useful. This *preparation* consists in measures
for asepsis and for the woman's comfort.

A general *bath* in warm water with plenty of soap and with careful
rinsing with pure water afterwards should be the first step. The
hair should be combed out and braided in two braids so that the
patient may lie comfortably afterwards. The patient should be in-
structed not to eat much meat or solid *food* for about a day before
she enters the hospital.

A *laxative* should be given twenty-four hours before the operation,
followed, after action, by a copious enema. It is better to time laxa-
tives or enemas so that they will not act during the operation, to the
annoyance of everybody, and to the danger of the patient. Castor
oil, when possible, is the best laxative. Calomel in doses of one quarter
of a grain every half hour until six doses are taken and then a dose
of sodium phosphate or sulphate is usually good. Phenolphthalein is

a useful laxative. Strong purges are bad, because they exhaust the patient, irritate the bowels, and tend to formation of gases as well as to favor infection of the peritoneum through the intestinal walls.

The *teeth and mouth* should be cleansed with the greatest care. If there are carious teeth, it is well to have them filled or otherwise suitably treated beforehand. The hairs of the abdomen and pubes are shaved and the site of operation rendered aseptic as before described.

If the woman is very *restless* and nervous, a dose of bromide may be administered. If she is much emaciated and weak, she may be given some broth or hot milk early in the morning of the day of operation. Otherwise it is better that she have nothing to eat for twelve hours previous to the appointed time. She may drink moderately if necessary to quench thirst. Just before going to the operating room, the woman should empty her *bladder* or, if it is not certain that she has emptied it, she must be carefully catheterized.

An operation in itself is enough of an ordeal for any patient without the necessity of overcoming the action of a lot of *drugs* or a lot of vigorous and fussy preparation. No drug is without harmful effects. No drug should be given before, during, or after the operation unless it is definitely indicated. The time before or after an operation is not a good time for the woman to have a diarrhea, to be stupefied by narcotics, or to be overstimulated. The effects of any anesthetic are bad enough without aggravation by injudicious medication.

CARE AFTER OPERATION

The young practitioner and the young interne are especially concerned in the care of the patient after operation. This subject is slighted in many textbooks, and the young man has to pick up the methods here and there from his attending man or from his consultant, often never acquiring a good knowledge of the *underlying principles*. There are almost as many different methods as there are different operators, but the principles ought to be the same in all. In this discussion it will be necessary to follow out some general principles which we believe to be well established, illustrated by methods which we believe to be rational.

Inasmuch as there are operators and operators, and inasmuch as the young practitioner must often work under the directions of one and the other, it will sometimes happen that he must take care of

patients who have not been operated upon in the best manner and who have not been left in the best condition. Therefore some methods of after-treatment must be described here which would not be described if every operation were perfectly performed.

The *perfect operation* leaves the patient with the minimum of shock, with all bleeding points secured and all oozing stopped, with all sutures securely placed and surfaces accurately coapted, with all necrotic masses completely removed, with all rough places in the peritoneum covered, with no dead spaces anywhere to fill with serum or blood, with all septic areas well drained, with viscera handled as little as possible, above all with no trace of septic matter added.

The *perfect anesthetist* has administered just enough of the anesthetic and no more, has not wounded or irritated the patient's face, mouth, or lips, has prevented her from vomiting, has known when to give stimulation and has known when to refrain, has not allowed himself to be flustered by ill-timed remarks or conflicting orders from a nervous operator, in short, has attended strictly to his business.

The patient who has undergone an operation under such favorable circumstances as these is in the ideal condition when she comes out of the operating room to receive rational care during the postoperative period.

Patients differ much in the way they go through the hours immediately after an operation. Some are very nervous, some bear pain well; some seem to have lost their nerve and make a great disturbance over slight annoyances; others are calm; and some are stoical. Some are irritable, exacting, even exasperating, demanding the impossible of their doctor and nurse; others are considerate to a fault, needing to have attentions thrust upon them. To quote from a distinguished authority on after-treatment: ''It should always be borne in mind that patients are entitled to every possible comfort or assistance, so long as it does not interfere with their recovery.''

There has been loss of blood, usually much sweating, and considerable loss of fluid from the respiratory tract with the deep narcotic breathing. The *body heat must be conserved* by enough warm bed clothing and by judicious use of hot water bottles. There is not a little danger of burning the patient's skin unless great care is taken to have the hot bottles, hot bricks, hot sand bags, or other objects used to furnish artificial heat properly covered. A patient recovering from

operation seems susceptible to burns from such sources. On no account should a patient be left alone until entirely out of the narcosis.

Thirst is often more annoying than pain. This is more intense when there has been considerable loss of blood or when the operation and the anesthesia have been prolonged. An enema of a pint or two of normal salt solution at a temperature of 107° to 110° F. administered just before leaving the table will usually prevent the most intense thirst, and has the advantage of increasing the bodily heat. It is a good routine measure after all operations of any severity or which have lasted more than an hour. Both ether and chloroform tend to diminish the watery constituents of the blood. Therefore thirst is largely the result of the anesthetic, probably more marked after ether.

If thirst is severe, the stomach may be washed out with normal salt solution and enemas given. These measures are also useful for the nausea and vomiting which is usually present after both of the usual anesthetics. Sipping of small quantities of hot water is often a great relief to thirst. Cold or iced drinks seem to increase it and certainly aggravate nausea. In some cases a very little champagne or sips of effervescent waters are grateful. Chloretone has been well recommended lately in three grain doses, once or twice repeated.

Nausea and Vomiting.—The amount and duration of the nausea after operation depend upon very many factors, some avoidable and some unavoidable. Other things being equal, the patient who has a so-called ''weak stomach'' will have more nausea afterwards. If the operation had to be conducted without proper preparation and with the alimentary canal full of food or fluids, there is almost sure to be much nausea and violent vomiting until the stomach at least has been emptied. In such cases great care must be exercised by the anesthetist to see that large pieces of food do not become inhaled into the air passages and choke the patient.

The *anesthetic and the manner of administering it* have much to do with the postoperative nausea. Ether seems a worse offender than chloroform. The least nauseating is nitrous oxide mixed with oxygen. Patients who secrete much mucus and saliva during the anesthesia swallow it, and, therefore, have full stomachs afterwards. In addition the amount of anesthetic swallowed is considerable and this remains in the stomach to cause disturbance.

Long operations, of course, mean much anesthetic and consequently more cause for nausea. If the vomiting is prolonged, excessive, or exhausting, it is advisable to wash out the stomach through the stomach tube with normal salt solution rendered alkaline with sodium bicarbonate. A small hypodermic dose of atropine, 1/100 to 1/200 of a grain, before the operation tends to diminish the nausea in many cases and also diminishes the secretion of mucus and saliva which is dangerous on account of liability of inhalation into the respiratory passages.

Nausea will always be lessened by quiet and often by tactful moral suasion on the part of the nurse or attendant. A little hot water often relieves even severe retching. Ice water sponging of the throat and neck are useful. Cold drinks and pieces of ice to suck or swallow are bad because they only increase the trouble and fill the stomach with cold water which is bad in cases of shock and which helps to detract from the body heat. In some cases it will be allowable to give a small hypodermic dose of morphine.

Posture.—It seems to be assumed by many operators, attendants, and nurses that the patient should be kept on the back for a considerable time after the operation. Even now the majority of surgeons and gynecologists advise that the woman be kept on her back for several days and in bed for a varying time, from three to six weeks or even more. Much used to be said about diminishing the chances of peritonitis or other kinds of infection by the dorsal posture. We know that infection can not be dependent upon posture unless there is already some infection present when the operation is completed. If so, the dorsal decubitus tends rather to the extension of peritoneal infection than to its inhibition.

The dorsal position in bed is not long comfortable to most people. Anyone who has himself undergone an operation of a major character will agree that lying on the back is a large part of the discomfort of the after-treatment. To lie on the back is not normal for many people; in sleep, most people lie on one side or partly prone.

Provided that the operation has been well performed, whether vaginal or abdominal, the sutures properly placed, and the wound properly bandaged and dressed, there is no reason why the patient should be forced to lie on the back, even directly after the operation. Indeed, she will breathe better and will inhale less mucus and saliva

if she is placed on the side, preferably the right. Fluids from the mouth and throat or vomitus will the more easily run out.

The patient may occasionally be moved to the back or to the other side or even to the semiprone posture from time to time, with the assistance of the nurse. The period of recovery from the anesthesia, when the patient is half drunk, has impaired will-power, is beginning to awake to a very disagreeable world, and is suffering from the disgust of the nausea is not a little relieved if her position in the bed can be changed occasionally.

In many instances the posture named for its inventor, the *Fowler's posture*, is of great utility, especially when the abdomen has been drained or when there is reason to suspect that the peritoneum may be partly infected. The posture is maintained as follows: A bed-rest is set at an angle of forty-five degrees behind the patient's back and is made more comfortable with pillows. If nothing more was done, the body would soon slip down so that only the head and neck would be elevated. Therefore a cushion is placed just in front of the buttocks, held in place by bandages running to the bed frame near the head.

Another way is to pass a sheet like a sling around the buttocks, fastened at each end to the head of the bed or to the top of the bed-rest. The patient does not make any effort to sit up but is held up by the bed-rest and the sling. Any possible infection in the abdomen tends, on account of this posture, to gravitate towards the pelvis instead of towards the diaphragm and thus to be limited. Drainage also is much favored. Even after vaginal operations, Fowler's posture part of the time makes the patient much more comfortable than a constant dorsal posture. In this position it is usually much easier to pass urine or to empty the rectum. Often catheterization is saved, and thereby perhaps a cystitis.

A great change has come over surgeons and gynecologists in regard to the time during which they keep their patients in bed. Many still advise *rest in bed* for many weeks, while one distinguished surgeon of Chicago allows his patients to get up as soon as they wish, even encourages them to get up on the day after the operation. No one can say that his results are not good. We can not advise quite such radical procedure for the young practitioner. We are still more or less

slaves to public opinion; especially must the public opinion of the profession be respected.

On the other hand, there is no good reason why all patients, even those who have undergone major abdominal operations, should arbitrarily be made to stay in bed for weeks. Some women need rest in bed even without operation. Those who have been suffering for a long time with a wasting gynecological trouble, accompanied by neurasthenia and debility, need rest whether they have been operated upon or not. If they have to undergo a prolonged suppuration after the operation, their strength must be conserved and they need rest.

Few, however, need absolute rest on the back in bed for weeks after any operation; indeed such prolongation of their bedridden state often works much harm. One may be guided to a considerable extent by the desires and the general condition of the patient. At least the posture should be frequently changed, and the woman should in most cases be encouraged to sit up in bed in Fowler's position or with a bedrest within a day or two after her operation. The circulation is better with the exercise thus obtained, the bowels act better, the respiration improves, the bladder gives far less trouble, and the muscular system does not acquire that excessive flabbiness which comes to the bedridden.

Thrombosis and air embolism need not be feared after twenty-four hours. Well-placed sutures will not tear out, especially if the dressings and bandages have been properly applied. Postoperative thrombosis will occur in a certain number of cases anyhow, but there is no evidence that early getting up favors its appearance.

Shock

The term shock is rather an elastic one. Practically it means pretty much the same as collapse, and is defined by Gould as ''relaxation or abolition of the sustaining and controlling influences which the nervous system exercises over the vital organic functions of the body, the result of a profound impression made upon the cerebrospinal axis, either directly through the agency of an afferent nerve or through the circulatory system.'' The degree of shock is dependent upon the severity of the irritation as well as the length of time which this continues in existence.

In a large number of cases the nervous phenomena are dependent

upon the loss of blood supply. The degree of shock may vary from slight faintness to the most profound collapse which may end in death. Laparotomies, especially where the intestines are much exposed or irritated, or for the removal of large tumors, are especially liable to be followed by severe shock.

Shock is exhibited in various phases, more or less dependent upon the etiological factors. It may be due to vasomotor depression without serious hemorrhage; as a direct result of hemorrhage; to the toxic effects of the anesthetic; to psychic disturbances. In most instances more than one of these etiological factors is present.

The **symptoms** of shock are chilliness or pronounced rigor; faintness, trembling, pallor, coldness of skin; clammy sweat; mental disturbances, from incoherency to delirium; dyspnea; fall of temperature one or two degrees; rapid and feeble pulse. The vasomotor variety shows distended veins and cyanosis of greater or less degree. The hemorrhagic variety is accompanied by intense thirst, air hunger, and pallor instead of cyanosis.

Shock due to the anesthetic usually appears during the anesthesia in the form of cessation of breathing due to the rapid reduction of arterial tension and consequent cerebral anemia. The toxic effects of the anesthetic may continue for many hours with embarrassment of respiration and with the other general symptoms of a rather mild type. The psychic and neurotic form is apt to appear in neurotic persons and in alcoholics, also in children even after slight operations. Such slight procedures as opening an abscess, puncture of the pleura, passage of a urethral sound, have been followed by most severe general symptoms of shock, even resulting in death.

The **treatment** of shock in general calls for the use of stimulants, especially morphine, adrenalin, digitalin, and alcohol. External warmth is essential, by means of wrapping in blankets and by application of artificial heat. Strychnine is much used, but is falling into disfavor of late. Normal saline solution introduced into the circulation by intravenous injection, by hypodermoclysis, or by proctoclysis is a valuable means in combating shock of nearly all varieties.

In shock due to hemorrhage, the blood should be kept in the brain so as to nourish the vital centers. To accomplish this the patient should be flat on the back with the foot of the bed elevated and the legs and arms snugly bandaged to drive blood out of the vessels of the extremities. For the shock due to the anesthetic, the general

treatment should be employed, and artificial respiration in addition. In some cases, especially where there is very marked heart failure as well as respiratory failure, vigorous digital massage of the heart from under the ribs may be valuable.

Psychic shock requires the general stimulant treatment with moral suasion and suggestion in addition, besides rest and perfect quiet. The alleviation of pain with morphine may be necessary.

Acute Dilatation of the Stomach

A rapid and distressing dilatation of the stomach, often extending to the intestines, is a condition following operations and labors, especially when anesthesia has been prolonged and deep. This condition is not infrequent and may give rise to serious symptoms and even death. It is due to the fact that a paralyzed stomach or gut permits rapid accumulation of gases from fermentation. Also the distention itself accentuates the paralysis and aids in the vicious circle. The distention makes itself apparent from eight to twelve hours after the operation.

The **symptoms** are marked distress in the upper abdomen, with disturbance of the heart, lungs, and portal circulation. Palpitation and cardiac weakness are joined with great dyspnea, all increasing with the progress of the dilatation. Shock becomes more and more evident. Percussion, as well as inspection of the upper abdomen, reveals the condition.

The **treatment** is to wash out the stomach by means of the tube, to empty the bowels by enemas, and to tone up the visceral musculature by means of eserine in doses of 1/100 of a grain every three hours and strychnine in doses of 1/30 of a grain as indicated. Pituitrin has been lately recommended.

Prophylaxis includes care and skill in the operation, the conduct of the labor, or in the administration of the anesthetic. After prolonged anesthesia, it is well to wash out the stomach through a nasal tube before the patient comes out.

Pain

Pain after operation may be due to so-called "gas pains," to the traumatism of inflamed or delicate structures incident to the operation, to imprisonment of nerve tissue by inclusion in ligatures, to

pressure of dressings, and other causes. Morphine should be used only when absolutely necessary because it tends to obscure symptoms and to tie up secretions and excretions. On the other hand, severe pain is a large element in the promotion of shock and always has a weakening effect which militates against recovery. The patient must first be allowed to come completely out of the anesthesia before morphine should be considered.

One must always remember the different susceptibilities of different patients to pain and the difference in their ability to stand it without complaint. If the patient is evidently suffering greatly and is very restless, it is usually permissible to give $\frac{1}{8}$ of a grain hypodermically, followed within half an hour by another dose of the same amount or more as indicated by the individual case. Morphine acts as a stimulant as well as an analgesic.

Postoperative Dietetics

In general it is best not to give any food for the first twelve to eighteen hours after an operation, especially if ether has been the anesthetic. In some instances, where the patient is especially weakened or has been without food for a considerable time before operation, it is advisable to give nutrient enemas within a few hours afterwards. In some cases, owing to an especially sensitive stomach, it may be necessary to continue feeding by the rectum for some days. Where the stomach has been washed out directly after the operation, food can usually be administered sooner than otherwise.

Nutrient enemas should be given by a rectal tube and a funnel rather than by a piston syringe. It is better to have the patient lie on the left side. The fluid should be heated to nearly normal blood heat, should be no more than eight ounces in amount and should seldom be given oftener than once in six hours. Milk peptonized by the complete method at body temperature makes the best nutrient for most purposes. Often milk and fresh beaten eggs or egg albumen are well borne.

The *first food by mouth* should be liquid and in minute quantities, even by the teaspoonful, until it is ascertained that the stomach will stand more. *Milk* peptonized by the incomplete cold process is best for such patients as bear milk well. Beef, mutton, or chicken broth is useful.

Broth should be made by cutting lean meat into pieces as large as the thumbnail, simmering them for several hours in water enough to cover, removing the large pieces and seasoning the unstrained remainder with salt. Beef teas and clear soups, while grateful to the taste, contain almost no nutriment. *Albumen water,* made by straining the beaten whites of fresh eggs, may be all that can be tolerated. *Orange juice* is often well borne by the second day.

For the *second and third days* soft diet may usually be employed. This may consist of broth with rice or barley, coddled eggs, junket, toast or milk toast, custards, sago and tapioca. *Coddled eggs* are prepared by bringing water to a boil (about one pint to each egg), putting in the eggs (previously warmed to room temperature), and taking the vessel off the fire. In from seven to ten minutes the eggs will be properly cooked, with the whites and yolks uniformly soft but without any unsightly mucus-like portions.

By the *end of the week* the diet may include fish, eggs, oysters, squab, white meat of chicken, sweetbreads, simple puddings, etc. Within two weeks, in uncomplicated cases, regular diet may be resumed.

Alcohol, with most practitioners, is now a rare part of the after treatment of surgical cases. Persons who are not accustomed to its use seldom bear alcohol well during illness. A small amount of light wine often is useful to stimulate appetite and to aid digestion, but stimulating quantities are seldom beneficial unless the patient has long been accustomed to them. Many advise alcohol in the form of brandy or whiskey in rather large doses in the treatment of septicemia. It has always seemed to us unwise to add anything in the way of a poison to the system of a patient already profoundly toxic from sepsis.

CHAPTER VI

ANESTHESIA IN GYNECOLOGY

Since the therapy of gynecological disorders is largely operative and since it is sometimes necessary to eliminate pain and muscular contraction during physical examinations of the female generative organs, it follows that the subject of anesthesia is important to the student of the diseases of women.

The operator and his assistants have their hands and minds full in attending to the duties incident to the operation itself. The best results in operating are obtained by operators of given skill when they are able to intrust the anesthesia to persons especially trained in that line of practice.

Senior students, internes, and younger practitioners are, under present circumstances, often called upon to give anesthetics. Students should take every opportunity of observing the administration of anesthetics and of studying the methods of anesthetists. Indeed, as they sit in the clinic seats during surgical operations, they will often learn more of practical advantage by studying and mentally criticizing the administration of the anesthetic than by studying the work of the operator. It may be many years before they will be called upon to perform major operations, but the probability is great that they will soon be called upon to give an anesthetic, perhaps in a difficult case.

Study of actual cases under guidance must be added to even the most perfect book knowledge in order to make a practical anesthetist.

First of all it must be remembered that all *anesthetics are poisons,* some more powerful and more dangerous than others. The drug used for narcosis must be pure. Therefore select the product of a reliable concern.

Fortunately women bear anesthetics better than men. The worst cases to handle are chronic alcoholics, especially the strong and muscular. Relatively few women come under this class. Women seem to go under the process with less fear than men, make less resistance and become less excited. They consequently require less drug to

bring them to the proper degree of narcosis. This circumstance is fortunate because most gynecological operations and examinations require a deep narcosis, sometimes rather prolonged.

Better results are obtained if the patient can be induced to have *confidence* in her anesthetist. A demeanor of quiet confidence in himself will often inspire faith on the part of the patient and tend to dispel that fear which is so natural, but which adds so much to the difficulties. Let the patient be assured by confident but not boastful words that she will speedily pass into a quiet sleep and that she will be protected in every possible way from danger and discomfort.

If she begins to struggle from suffocation, the mask should be removed a little from the face and an encouraging word spoken. There should be no haste manifested in the early part of the anesthesia; the drug should not be poured on nor the mask held violently on the face. The inhalations should not at first be too deep. Only the administrator should speak to the patient and others should refrain from talking, telling stories, or laughing while she is still capable of intelligent observation.

The *preparation of the patient* does not usually fall to the duty of the anesthetist, but it is always well, if possible, for him to make her acquaintance some time beforehand. In emergency cases, the patient will sometimes have a full stomach. It is safer to empty it by lavage or to have her drink several copious draughts of warm water until emesis occurs. The inconvenience of having the patient vomit while on the table is only one minor factor. There are real dangers, such as infection of the wound, inhalation of vomitus, and the impaction of solid food in the air passages, which render a full stomach so undesirable.

Always *look in the mouth* before beginning. False teeth and other foreign bodies must be removed. Sometimes the presence of mucous patches will warn the anesthetist to wear gloves.

The arms should be extended at the sides with the palms towards the thighs, and secured by a strap or bandage, which may easily be loosened in emergency. The hands thus placed are more out of the operator's way during a laparotomy than when folded across the chest. No weight should be permitted upon the chest. The anesthetist should warn an assistant, or even the operator, if he sees him resting an arm upon the woman's thorax during the operation.

The patient has work enough to raise her own chest in breathing.

The question of *restraint* during the early stages of anesthesia is an important one. If there are plenty of intelligent assistants handy, *manual restraint* should be the only kind used, and this should be of proper quality. The minimum of restraint is the desideratum but there should be constant watchfulness so that sufficient may be employed at the right time. A skillful anesthetist will usually put the patient under with little or no struggling.

Mechanical restraint is better than insufficient or poorly applied assistance. It is far better for the woman to be held to the table by a strap just above the knees and even to have the wrists manacled to a strap passed under the small of the back than to have several husky and foolish attendants throw themselves violently upon her to prevent her from jumping off the table. All such restraining straps should be capable of easy loosening.

The *feeling of suffocation* which comes on early in the process is the reason for the struggles of the half crazy patient. The skillful anesthetist will seldom have struggling patients because he will seldom allow them to experience this violent feeling of suffocation. He will gain the confidence of his patient at the outset. He will not allow himself to be hurried but at the same time he will make continued progress with his work. If he notices signs of suffocation which presage a rebellious struggle, he will lift off the mask for a moment while the woman gets a breath of fresh air, encouraging and soothing her the while with comforting words.

A *previous physical examination* should have been made of the urine, and the anesthetist should know the results. The report will perhaps influence the choice of an anesthetic, and surely will influence him in his method of administration, as well as cause him to be on the lookout for threatening symptoms. If the heart and lungs have not been previously examined by a competent person, the anesthetist must himself see to the condition of those organs.

During the administration he will have the pulse constantly under observation. He must train himself to distinguish its variance at the temporal, facial, or carotid arteries, because he will not have the opportunity of feeling it in the usual locality, the radial. The color of the skin and visible mucous membranes and the condition of the pupils should be noted at the outset so that any changes therein during the course of the operation may be given proper weight.

It is embarrassing, for instance, to find that the noncontractile pupil, on account of which one diminishes the amount of the anesthetic, belongs to a glass eye.

ETHER

Sulphuric ether is the drug most commonly used in this country, and may be taken as the typical anesthetic as to administration, course, and depth of narcosis, symptoms, sequelæ, and dangers. One who understands how to give ether well can easily learn the other common anesthetics.

Having complied with the preliminaries as before mentioned, the anesthetist seats himself behind the head of the reclining patient. If possible it is best to have the anesthetic given to the patient already lying upon the operating table in the operating room, or in an adjoining room from which the operating table can be wheeled into the operating room. The exact time of beginning the ether, of beginning the operation, of ending the etherization, and of ending the operation should be noted on a pad.

On a table at hand should be a gag, a hypodermic syringe filled with a solution of 1/30 of a grain of strychnine, a few swabs of gauze, and one or two long dressing forceps, a few clean towels and a fresh mask. A tongue forceps is not needed. If it should become necessary to pull the tongue outwards the jaws should be opened with the gag and the gauze-covered finger and thumb can reach the tongue.

A wedge-shaped piece of tough wood with rounded edges is a good gag for the purpose. Its small end can be forced between the back teeth and then the piece of wood can be turned from the flat to the edge so that the broad aspect holds the jaws apart and the mouth open. Numerous gags are manufactured which also suit the purpose. The homely one which I have described may be whittled out of a stick in a few minutes.

The most convenient *inhaler* is the ordinary Schimmelbusch mask of Esmarch type made of wire and covered, for ether, with two layers of stockinet or twelve to twenty of gauze. The covering will be thicker and more abundant than for chloroform. A piece of moistened cotton or a towel should be laid over the eyes to prevent irritation from the vapor, but there should be good opportunity afforded for frequent inspection of the eyes during the course of the

operation. The patient should breathe through the dry mask for a few whiffs, then ether should be dropped gradually upon the outside, and the mask brought gradually nearer and nearer to the face, until it almost covers the mouth and nose. The cloth should be kept saturated by constant dropping of ether distributed evenly over the mask.

As the anesthesia becomes deep, it should be kept at a constant level, never becoming dangerously deep, and never so light that the

Fig. 51.—Method of ether administration.

patient begins to struggle again. During the latter part of the induction stage, a towel may be folded around the margin of the mask to retain the vapor. This is not usually needed during the operation. The vapor inhaled during the induction stage should contain 30 per cent of ether and during the surgical stage 15 per cent.

The method described and advised is called the *open method* of etherization. The patient is supposed to breathe air through the coverings of the mask, and with it, the vapor of the drug which

saturates the coverings. Therefore the coverings must be porous enough for the air to get through and yet not too much so, lest too great a proportion of air be breathed and not enough ether.

Acapnia.—It is well not to encourage the patient to breathe too deeply during the preliminary stage because of the danger of acapnia. This means lack of the normal percentage of carbon dioxide in the blood, which is the usual stimulus to respiration. Too many very deep breaths may reduce the percentage of this gas, and cause stoppage of respiration, which sometimes may be permanent unless breathing is started up again by artificial methods. Often a few slaps on the chest or a few movements of artificial respiration will start the breathing again.

Stages.—It is profitless to try to divide anesthesia into definite stages, which are not present in all cases and which differ so much in different cases that they are not characteristic. If the anesthetic is given with care and tact in the beginning the so-called *stage of excitement* will seldom be marked except with alcoholics.

As narcosis deepens, the breathing will become slow, regular, and deep. The nervous tension of the muscles, the pain and touch reflexes, and the conjunctival reflex will cease. This last should never be tested by touching the eye with the finger but by pulling up the upper lid. When the reflex is present, raising of the lid will be resisted; and when it has gone, anesthesia is usually complete enough for surgical purposes.

The *pupils* in the beginning are slightly dilated, but react to light. As narcosis deepens they contract, but react to light. Then they gradually dilate, becoming less and less reactive to light until, at the dangerous stage, they are widely dilated but do not react.

Ether stimulates *secretion of saliva and mucus* and causes efforts at swallowing in the early stages. At the surgical stage, swallowing and coughing are inhibited, but usually these fluids are lessened in amount. When excessive secretion persists, the anesthetist must try to prevent inhalation of fluids into the air passages. This can usually be accomplished by turning the head well to one side when the fluids will collect in the cheek and can be wiped out with a swab. Swabbing the pharynx is seldom necessary and usually only aggravates the trouble.

Respiration is a good sign of the depth of the anesthesia. It is deep and regular in the perfect surgical stage, irregular and sigh-

ing if narcosis is becoming too light, stertorous if becoming too deep, and shallow and rapid or stopping altogether at the dangerous stages. The proper point to be attained is to give just enough ether to maintain the perfect surgical stage. Therefore the anesthetist must be constantly on the watch for the symptoms of returning consciousness as well as of too deep narcosis. If anesthesia is too light, there may be laryngeal spasm and holding of breath.

He must *watch his patient* but that does not mean that he shall not also *watch the operation.* He must not become absorbed in the surgical aspects but he must see what the operator is doing, because manipulation and traumatism to different structures will influence the action of the patient under the anesthetic.

For instance, when the intestines are pulled upon, the respirations often become shallower and quicker for a time. When the stomach is manipulated, the pulse often falls in strength and rises in rate. Stretching of the perineum and of the sphincter ani usually causes some manifestation of pain, even in apparently deep narcosis. Stretching of the sphincter will sometimes cause breathing to be resumed when it has ceased from acapnia or other causes.

In prolonged operations, or in operations upon weakened individuals, the anesthetist is in position to know the extent of the shock and his duty requires that he shall inform the operator when the pulse becomes alarmingly quick or weakened, when the face shows a dangerous pallor or a cyanosis which he knows is not due to too much anesthetic.

For weak heart action he may suggest or ask permission to give stimulants, such as strychnine (1/30 grain), digitalin, or adrenalin. For cyanosis he may desire to administer oxygen by inhalation. This also is beneficial in shock. Given after the anesthesia it often hastens recovery of consciousness.

Complications.—Certain complications must be avoided or removed during the anesthetization. If the jaw sags backward and downward, carrying the hyoid and the tongue with it, respiration may be interfered with. The proper way to hold the jaw forward is to put the fingers of both hands under the angles of the jaw and draw it forward so that the lower teeth extend beyond the upper teeth. Once having so pushed the jaw forward, it is easy to keep it there.

Vomiting during anesthesia is usually a sign of returning con-

sciousness and often occurs after respiration has been reestablished, because of the lack of anesthetic during its temporary cessation. It is best, if vomiting has actually begun, to allow the stomach to be emptied before crowding the ether again. It is better to compel the operator to wait a few moments and, if necessary, to protect the escape of the intestines from the abdominal wound, than to try to hold back the vomiting by crowding the ether, running the risk of inhalation of vomitus into the deep air passages and consequent liability to postoperative pneumonia.

Sometimes *muscular spasms,* including those of the jaw and throat, come on and interfere with the operation. This usually means that too free use of ether has caused its vapor to become too concentrated, requiring breathing of air at once.

There is a less severe but rather annoying *clonic spasm* of the legs (sometimes of the arms also) which may occur in alcoholics and which is sometimes difficult to stop. Often changing the position of the legs will cause cessation or it may be remedied by pressing the anesthetic to a deeper stage. If it is persistent and if it interferes greatly with the operation, it may be necessary to change to chloroform for a little while until the spasms pass off.

Cyanosis will be observed by the operator as well as the anesthetist by reason of the blueness of the blood. Its appearance usually indicates too much ether, or too little air. It requires removal of the mask for a few moments, or it may require the removal of some of the superfluous coverings which interfere with the proper supply of air with the ether.

If respiration ceases, the finger should at once be passed into the throat to find out whether there is any obstruction there. Ether must be removed and the skin of the chest stimulated by a few slaps. The jaw must be drawn forwards. If breathing is not at once resumed, artificial respiration must be instituted, even at the cost of interrupting the operation. Lowering the head of the table does no good with ether, but is useful if the condition is due to chloroform or shock. Mechanical respirators of the pulmotor type are falling into innocuous desuetude.

The *Sylvester method* is generally chosen. The arms should be elevated above the head and depressed against the chest and the chest compressed rather forcibly at regular intervals of about eighteen to the minute. The motions of the arms are not essential. Many

omit them. Many novices make too rapid movements in artificial respiration, forgetting that the rate should be no faster than in normal breathing.

The cause of this cessation of breathing may be due to shock from operative trauma, to too concentrated ether vapor, to too deep narcosis, to acapnia, to heart failure, or to death. If due to shock or cardiac failure, stimulants should be given hypodermically and the heart should be massaged by grasping deeply under the left costal margin.

When shock is threatened, as will appear from the pulse and the facial pallor, the anesthetic should be given very lightly, even to the extent of permitting some restlessness on the part of the patient. If due to too great concentration of ether vapor or to too deep narcosis, the mask should be temporarily removed or oxygen may be substituted for a time.

Ether is the most satisfactory anesthetic to be administered by the unskilled practitioner. The blood pressure rises at first, but becomes lowered as ether is prolonged. Other methods besides that already described are sometimes employed, but are improper for the novice. One of these is the so-called *closed method*. This involves the use of a rubber bag attached to some form of inhaler. The expired air and vapor are breathed into the bag and rebreathed. Fresh air is admitted as indicated through a valve in the mask of the inhaler.

The *vapor method* of inhalation is accomplished by pumping air through a Woulff bottle containing ether, so that the mixed air and ether vapor reaches the patient through a metallic or celluloid mask. This method permits of warming the ether in the bottle and is advantageous in certain cases.

When there is much nervousness manifested by the patient, the *gas-ether sequence* is sometimes valuable. Nitrous oxide gas is inhaled through an appropriate apparatus until unconsciousness takes place, when a mask well moistened with ether is at once applied and etherization established before recovery from the gas anesthesia. In most cases the preliminary struggling and the suffocation of the first stage are eliminated. The cyanosis, inseparable from the use of pure gas, can be prevented by mixing oxygen with the nitrous oxide as it is inhaled.

Advantages of Ether.—It is cheaper than most other anesthetics except chloroform. It is easiest to give. Its mortality rate is less

than some others, especially chloroform. It is very flexible in its action, in that the margin between too light and too deep narcosis is greater.

Disadvantages of Ether.—It is bulky, consequently impracticable for some emergency work. It is inflammable and explosive. It is disagreeable to take. It causes more postanesthetic vomiting than most other drugs. It increases the secretions of mouth, pharynx, and bronchi with increased danger of inhalation pneumonia. It renders the anesthetist, the operator, and attendants disagreeable to many people on account of the odor of ether which they carry on the breath.

Ether is contraindicated in cases of edema of the glottis, of acute lung disease, of high blood pressure, and of low hemoglobin index.

A ready *test for the purity of ether* is to allow a little to evaporate in a watch-glass. If acid impurities are present, the residue will turn neutral litmus paper red.

CHLOROFORM

Advantages of Chloroform.—It is cheaper and better adapted for emergency work because only a small amount is needed for each case. It causes less postanesthetic nausea and vomiting than ether. It lowers blood pressure from the start and consequently is better adapted for use in cases of renal and cardiac disorders characterized by high pressure. It does not cause increased secretion of saliva and mucus. It is not irritating to the air passages, and consequently seldom causes cough. It is not inflammable. It induces anesthesia rapidly and with less struggling and suffocation than ether. It requires no special apparatus. Its odor is rather pleasant than otherwise.

Disadvantages of Chloroform.—Its mortality rate is higher than any other commonly used anesthetic. It is especially dangerous when administered by unskillful persons, since the margin of safety between too little and too deep narcosis is small. It kills by cardiac paralysis and consequently gives far less warning than ether, which usually kills by stoppage of respiration. Most deaths from chloroform occur during the first few minutes, therefore one should begin very gradually.

Chloroform *can not be administered by the closed method* without

great danger. A vapor containing two per cent of chloroform is the maximum strength permissible. The drug must be given in such a way that a large proportion of air may be inhaled with it. The *Esmarch mask* was designed for chloroform and is the best inhaler for the purpose. Its frame should be covered only thinly with stockinet or other suitable cloth, and the fluid should be dropped upon the center of the mask. The whole mask must never be saturated, and the rapidity of the dropping will depend upon the depth of the anesthesia. As with ether, the mask should be brought gradually to the face and the amount of drug should be increased gradually. The struggling and strangling stages sometimes noted in etherization are absent with chloroform.

The administrator must be constantly on guard in respect to the pulse and the conjunctival and pupillary reflexes. It is much easier to reach a dangerous depth of anesthesia with this drug than with ether because its action is much quicker. Because its action is so rapid, the anesthetist may allow his patient to come out of the deep anesthesia a little, so that he may always be on the safe side of the margin. A few whiffs of the vapor will quickly bring her back again if she begins to show signs of returning consciousness.

Patients seem to pass into a state of narcosis much quicker with chloroform than with ether, but seem to take as long to come out. Given by a person who appreciates the potential dangers of chloroform, and who has had considerable experience in its use, the anesthetic is probably little more dangerous than ether. It is surely less dangerous than the latter given carelessly or ignorantly.

The *main points to be observed* in chloroform anesthesia are to watch the pulse and pupils with especial care, being ready to remove the mask temporarily whenever the pulse shows weakness or the pupils dilate unduly; to use as little of the drug as possible; to see that the patient gets plenty of air.

Chloroform is *contraindicated* in cardiac disease with impaired compensation, in advanced arteriosclerosis, and in shock. Chloroform acts by paralyzing the nerve centers, first the cerebral lobes, next the cerebellum, later the cord, and last the medulla. It is toxic to the heart muscle and to the ganglia of the heart. It passes through the placenta and through the breasts to the fetus and the child, to a greater degree than other anesthetics.

The *late results of chloroform* are fatty degeneration of the liver,

heart muscle, and, to a less extent, the kidneys. *Late results of ether* are irritation of the respiratory passages, paving the way for pneumonia and other pulmonary infections, irritation of the kidney epithelium and irritation of the gastrointestinal tract from the same cause.

Hepp's test for chloroform is to drop a little on filter paper. After it has evaporated, there will be no odor if it is pure. Chloroform vapor will decompose in a room with an open light and the phosgen gas, hydrochloric acid, and chlorine thus formed are irritating to the air passages, often annoying to operator and assistants unless there is good ventilation.

NITROUS OXIDE

Nitrous oxide gas, sometimes called "laughing gas," has been employed by dentists for extraction, and by surgeons for short operations, for many years. It has usually been given pure by inhalation directly from the tank through a tube and a mouth-piece or bell-shaped mask. Given thus, it always causes great cyanosis because of the lack of oxygen. If given for a long time, it must frequently be stopped so that the patient may breathe air to keep from suffocation. Therefore, throughout a long operation, the patient will constantly be deeply anesthetized and asphyxiated or half conscious and struggling, in alternation.

Gas produces anesthesia quickly, even within a few seconds. A few minutes or seconds after its removal, complete consciousness returns. It cannot well be administered mixed with air because the production of satisfactory anesthesia requires a large percentage of gas. To get enough oxygen from the air, with its large proportion of inert nitrogen, the percentage of nitrous oxide inhaled would be insufficient to produce anesthesia.

Gas and Oxygen.—Of late years the difficulty has been overcome by giving pure oxygen with the nitrous oxide, so that the anesthetic effect of the latter is accomplished and the ten or twenty per cent of oxygen permits at the same time sufficient oxygenation of the blood. By this method the two gases are given, each from its own bag, in proportions governed by a valve which permits the administrator to vary them at will.

Some forms of apparatus also have an appliance for giving inhalations of ether vapor in addition. Nitrous oxide does not always cause

enough muscular relaxation for abdominal operations, so that the slight amount of ether used will sometimes be desirable.

Nitrous oxide, especially when mixed with oxygen, is by far *the safest anesthetic.* Its administration for prolonged anesthesia requires more care and experience than the others in order to keep the patient sufficiently under the influence of the drug, and to prevent asphyxia from the deoxygenation of the blood. Skill is necessary to maintain the proper mixture of gas and oxygen so·that the anesthesia shall be deep enough and the patient shall get· oxygen enough.

Fig. 52.—Surgeon's nitrous oxid apparatus.

By proper variation of the supply from the gas bag and from the oxygen bag this happy mean is attained. The pink hue of the skin and the regularity of the breathing show the absence of an uncomfortable degree of asphyxia; while the pupillary and conjunctival reflexes show the evident freedom from pain; and the absence of the slightest struggling shows that the anesthesia is deep enough.

Gas anesthesia is coming more into use each year, even for operations requiring deep narcosis and considerable time. The method is

pleasant for the patient, both in going under and in waking. The struggling stage is almost always absent. The patient experiences a ringing in the ears and soon goes into a deep sleep from which she awakens within a few minutes or seconds after removal of the mask to complete consciousness without the disagreeable sensations experienced after ether or chloroform.

Postanesthetic nausea and vomiting are reduced to a minimum, usually indeed to nothing. Even the small amounts of ether which may be needed to maintain perfect relaxation during the handling of intestines and similar maneuvers seldom cause any uncomfortable symptoms. There are no serious complications afterwards, no changes in the vital organs, and practically no mortality. So far only one instance of death has been reported as due to the anesthetic. Experimentally, animals have been kept under nitrous oxide and oxygen for days at a time with no demonstrable evil results.

Advantages of Nitrous Oxide and Oxygen.—It is pleasant to take. The influence of fear is eliminated. There is no irritation of the mucous membranes. The excitement stage is absent. The recovery is almost immediate after removal of the mask. There are no serious sequelæ. The hemoglobin index is not lowered. There are no changes or degenerations in the vital organs. The mortality is almost nil.

Disadvantages of Nitrous Oxide.—It is expensive. It requires a complicated, bulky, and heavy apparatus. It requires a skilled administrator in order to keep the anesthesia constantly deep enough for operative purposes without asphyxia.

Since nitrous oxide increases the blood pressure it is *contraindicated* in patients who already have a high pressure. For most gynecological operations it is the ideal anesthetic, provided that one can command the services of an anesthetist experienced in its use. It is not an anesthetic which can safely be used where the operator is obliged or thinks he is obliged to dominate the anesthetist.

DANGERS OF ANESTHESIA

The **status lymphaticus** may cause sudden death, usually early in the administration. This condition is characterized by pale, pasty complexion, enlarged glands in the neck and elsewhere, adenoids, and enlarged tonsils, a hypertrophied thyroid, a persistent thymus, and low blood pressure. It more commonly occurs in children. Death

may be almost instantaneous and without warning, even after a few whiffs of the anesthetic.

Acidosis, acetonuria, and **acid intoxication** may cause death, especially within a few hours or days after the operation. These accidents are more likely with chloroform and are more to be expected if the patient has been deprived of carbohydrates for several days previous to the operation. The symptoms somewhat resemble those of acute yellow atrophy of the liver. Fat persons are more subject to them than spare persons. There is usually continued vomiting which resists treatment. The best treatment is to wash out the stomach with a soda solution and to leave a little therein. Dextrose or glucose may be given by the rectum.

Ether and chloroform have a *cumulative* deleterious effect upon the system. Immunity is diminished by both. Repeated administrations of either within a few days are increasingly dangerous, perhaps more so with chloroform than with ether.

MIXED ANESTHESIA

Mixed anesthesia requires but brief mention. Various formulas of admixture of ether and chloroform, with, or without alcohol, have been, and are still, recommended in some clinics. The opinion is increasingly prevalent that these mixtures combine the disadvantages of both anesthetics with little addition to the advantages. Bromide and chloride of ethyl are lauded by many as general anesthetics but have not obtained a secure place.

Mixed narcosis, which combines a general anesthetic with a powerful anodyne, is much employed in one form or another.

The so-called **scopolamine-morphine anesthesia** had quite a vogue in many European clinics. The principle of this method consists in giving fairly large hypodermic doses of morphine combined with scopolamine (hyoscine) to enhance the effects of the morphine. Morphine alone would require a dangerous or fatal dose in order to produce narcosis sufficient to deaden the pain of an operation.

The method established by Schneiderlin, the father of this form of narcosis, is to give an injection of scopolamine of about 1/100 gr. combined with about 1/4 gr. morphine four hours before the operation hour. This injection is repeated in two hours, and again, half

an hour before the operation, a third dose is given. Some have made
these doses much larger.

The attempts at first were to obtain narcosis entirely from the in-
jected drugs without inhalations of ether or chloroform. This some-
times happened. In all cases the original scopolamine-morphine
method enabled the anesthetist to use a very small quantity of the in-
haled anesthetic, sometimes only a few whiffs at infrequent intervals
when the patient partially wakened. In most instances the scopolam-
ine-morphine dose is not large enough to produce anesthesia without
inhaled anesthetics, such as ether or chloroform, but only a small
amount of the latter is necessary. The danger is that the inhaled
narcotic may easily go beyond the toleration point and the patient
die by failure of respiration.

Dangers.—The inhaled anesthetics are rapidly eliminated and
overdoses, to a certain degree, can be taken care of by the forces of
the body soon after the drug is removed, especially if the process
of elimination is aided by artificial respiration. The injected nar-
cotics, once within the body, will remain for several hours to poison
the system before they are eliminated. Patients vary greatly in idio-
syncrasy as to narcotics. An overdose of morphine, for instance,
cannot be quickly removed but an overdose of ether or chloroform
is quickly eliminated by the respiratory organs.

The patients who have had the scopolamine-morphine treatment
sleep deeply for hours after the operation. It is true that they do
not then suffer pain but the large dose of morphine masks all other
symptoms and surely hinders the vital processes so necessary for
repair.

Very many surgeons and anesthetists give *preliminary injections
of morphine* or of atropine or of both, an hour or so before the
operation, with the object of diminishing secretion of saliva and
mucus and of diminishing the extent of the struggling stage of the
anesthesia. The reflexes and the pulse, as well as the respiration,
are interfered with by these drugs and most of the signs and symp-
toms which indicate to the experienced anesthetist the progress and
the depth of the narcosis are obscured.

In the inhaled anesthetics we are dealing with poisons which are
dangerous enough and others should not be added to complicate mat-
ters without very definite and urgent indications. Few women need
them. The experienced anesthetist usually prefers to simplify his

work as much as possible. Few trained anesthetists use preliminary doses of morphine and atropine.

LOCAL ANESTHESIA

Simple pressure on a part for several minutes will sometimes paralyze the superficial nerves of sensation enough to enable one to perform some of the minor operations upon the skin.

Freezing a small area by liquid air or carbon dioxide or by a spray of ethyl chloride will often be sufficient for opening an abscess. It is open to the disadvantage that the frozen part is difficult to cut.

Subcutaneous or intraareolar injections of cocaine, stovaine, or other similar drug will often suffice for quite extensive operations where there is little fear of shock. The method of Schleich is the usual one. *Schleich's* strong solution consists of cocaine, gr. 3; morphine, gr. 2/5; sodium chloride, gr. 3; and water dr. 3 2/5. His weaker solution is the same, except only 1/6 gr. of cocaine is used. Of the stronger solution considerable quantities can be injected into the deeper layers of the skin and into the subcutaneous tissues, always falling short, however, of what would involve a toxic dose of cocaine. His weaker solution can be used in correspondingly greater quantities.

Schleich's solution must not be used in or near infected areas. It has the disadvantage that the large amount of fluid combined with the natural edema incident to the irritation of the solution itself obscures the operative field.

Nerve blocking consists in injection of solutions of a local anesthetic into the sheaths of nerves or in the close neighborhood in the surrounding tissues. It anesthetizes the area supplied by the nerve.

SPINAL ANESTHESIA

Nerve blocking led to the introduction of spinal anesthesia or spinal analgesia. By this method the injection into the subdural space of the spinal cord blocks sensation in all parts below the point of injection. The method is by no means new but has been revived at different times in various ways. At first cocaine was the drug employed. Later novocaine, tropocaine, and stovaine were substituted, sometimes mixed with adrenalin or with strychnine.

The sterile solution of the drug is injected, by means of a long

slim hypodermic needle, into the space between the third and fourth lumbar vertebræ. Sometimes the space between the second and third is chosen. The needle is introduced at a point slightly to one side of the exact middle line and just below the spine of the upper vertebra.

The depth of the needle thrust varies from two to three inches, depending upon the thickness of the soft parts. The needle is introduced without the syringe. Entrance into the spinal canal is indicated by the passage of a few drops of clear cerebrospinal fluid. A little of this is allowed to exude from the needle and then the syringe is attached and the solution is slowly injected.

Asepsis must be as strict as for a major operation. The patient's shoulders must be slightly elevated so that the solution cannot gravitate towards the upper parts of the spine or the cranium. Within five minutes the parts below the place of injection will be entirely anesthetic, although the patient will retain full consciousness.

The method is not without danger, especially in the hands of the novice. It is indicated in cases where any general anesthetic is contraindicated and where local anesthesia is impossible. Its field is a very limited one.

CHAPTER VII

ANOMALIES OF THE FEMALE GENITALS

Anomalies of the female genitals may be divided into those by defect; those by excess; those by defective union of the muellerian ducts; and hermaphroditism.

ANOMALIES BY DEFECT

Complete absence of the whole genital canal may exist, but is extremely rare. It is usually associated with other grave defects in development which are incompatible with independent existence. Absence of the whole of one organ is only a little less rare than absence of all of the genitals. It is often associated with nonviability.

Defect of the Uterus

Complete absence of the uterus is very seldom observed and is usually associated with faulty development of the tubes, ovaries, and vagina. When the ovaries are functionally active, there may be disagreeable symptoms occurring periodically, which are called the molimina of menstruation. Sometimes a so-called vicarious menstruation takes place in the form of congestion and hemorrhage in some other part of the body, especially the nasal mucous membrane.

Faulty development of the uterus is more common than complete absence. There are three general types, namely, the fetal, or infantile uterus; the unequal uterus; and the atrophic uterus.

The **infantile uterus** remains throughout adult life in the same condition and much the same size as in the fetal or infantile state. The length of the body of the uterus is less than that of the cervix, often less than one-third. In many cases the cervix is nearly normal in development while the corpus can hardly be distinguished, but, commonly, the cervix also is somewhat smaller than normal.

The **unequal uterus** is one which is unevenly developed. The organ may lie obliquely in the pelvis because of the maldevelopment of a

portion. *Congenital flexions* of the uterus belong to this class of unequal development. A portion of the anterior wall is undeveloped in anteflexion and a portion of the posterior wall in retroflexion. The cervix may be wholly or partially undeveloped where the body of the organ is normal.

The **atrophic uterus** appears merely as a small uterus. The condition may be congenital or acquired. The form of the organ is perfect, but it is deficient in size. The acquired form may result from premature climacteric, from excessive involution during prolonged lactation, from interference with the blood supply due to various causes, and from the changes due to old age.

Diagnosis.—The symptoms of defective uterus may be scanty
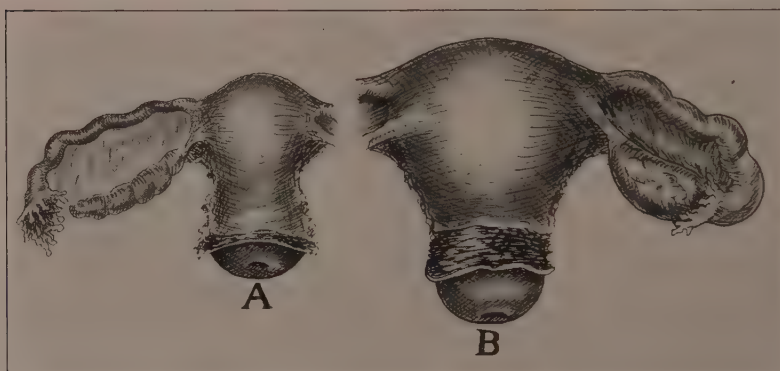
Fig. 53.—*A*, infantile uterus; *B*, normal adult uterus.

menstruation, amenorrhea, sterility, sexual frigidity, or dysmenorrhea. Often the *molimina of menstruation*, consisting of indigestion, pains in the pelvis and back, nausea, vertigo, hot flashes, and other nervous phenomena may recur with each month, provided that the ovaries continue to functionate.

Bimanual vaginal or rectal examination will reveal the rudimentary character of the uterus. Complete absence of the uterus, as well as of the tubes and ovaries, can not be positively distinguished from a rudimentary condition of these structures. Often the vagina also will be small in caliber and in length, and sometimes the vulva will be imperfectly developed.

In the cases of *congenital flexion* the pain with menstruation usually

comes on before the flow of blood is established and ceases soon after-
wards. This has led to the belief that the pain is due to the efforts of
the uterine muscle above the kink to force the blood through the nar-
row part of the tube. The pains are often very severe and of a con-
tracting character. When the blood begins to flow freely, the suffer-
ing often ceases. Nevertheless it is probably not true that the
dysmenorrhea in congenital anteflexion and retroflexion is due to the
kink in the uterine canal and the consequent uterine contractions.
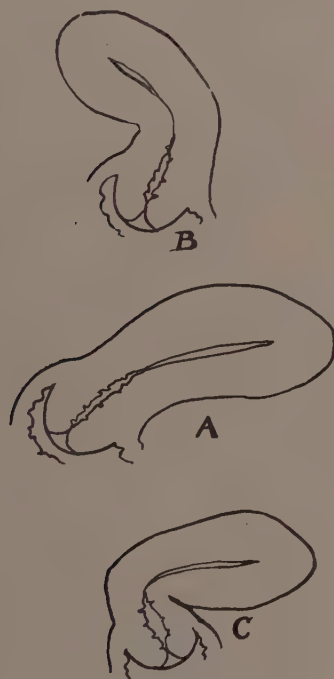
Fig. 54.—*A*, normal uterus; *B*, retroflexed immature uterus; *C*, immature anteflexed uterus.

The same theory of obstruction is used to explain the painful men-
struation in cases of congenital stenosis of the cervix.

It is a fact that a sound can be more easily passed at the time when
the pain is the worst. Therefore menstrual blood, which is seldom
clotted, ought to pass easily. The pain is probably not due to an ob-
struction of the canal, but rather to a maldevelopment of the uterine
wall.

The fibromuscular tissue of the uterine wall is poorly developed at the region of the bend and in the region of the congenital stenosis. The muscle fibers are relatively scanty at the affected localities and there is a relative preponderance of fibrous tissue there. This fibrous tissue acts like cicatricial tissue and imprisons the terminal nerve filaments. With the onset of the swelling incident to the congestive stage of menstruation, these filaments are compressed and pain results. When the blood begins to flow, the degenerative stage of menstruation is beginning and the congestion is diminishing. Therefore the compression of nerves is relieved and pain ceases.

Defect of the Ovaries

Complete absence of both ovaries is very rare and is usually accompanied by other gross defects in the genitals. Absence or extreme atrophy of one ovary is less rare. Rudimentary ovaries are the rule in cases of infantile uterus. Normally the ovaries, as well as the rest of the genitals, undergo atrophy with the advance of age after the climacteric period. The poorer the development of the ovaries, the more likely will there be amenorrhea and sterility.

Defect of the Tubes

Defective development of the tubes follows closely upon defective development of the ovaries and uterus. It is not very rare for one tube to be absent or very minute. Sometimes one tube appears as a stump attached to the angle of the uterus, as if it had been amputated by some membranous band.

Defect of the Vagina and Vulva

Total lack of vagina or vulva is very rare. *Hypoplasia* is more often observed. With infantile uterus the vagina is likely to be defective in development; the vulva less often. The vagina may be of smaller caliber than normal and may be shorter. The vaginal walls are thinner and less elastic. The labia majora and minora may be rudimentary and the vulvar opening small. These anomalies are often associated with defective development of the uterus and ovaries.

Results.—The main practical effect of faulty development of vulva and vagina is the interference with coitus. Sterility results from the

incompleteness of the coitus and from the frequent maldevelopment of the uterus, tubes, and ovaries which may coexist.

Persistent Cloaca

Etiology.—In the early embryo, as in adult birds and reptiles, the urinary, genital, and intestinal canals all empty by one external opening, called the cloaca. By the development of a partition between rectum and vagina and by the development of the perineal body between the anus and vulva the gut is shut off from the genital canal. By the growth of the urethra, the urinary tract is shut off from the genital tract. The cloaca is developed from a pouching inwards of the integument. By many authorities, the vagina, at least in its lower third, is believed to develop from such an invagination of the ectodermal structures.

Rarely the cloaca may persist completely, but usually the vagina is partially separated from rectum and urinary tract by a partial development of the septa. Faulty development of the posterior commissure of the genital opening results in *anus vaginalis,* or *anus vulvaris.* Sometimes the pouching inwards of the skin which normally forms the anus is lacking and the vaginal or vulvar opening of the rectum is the only one. Sometimes the anal invagination is complete, but there is also an opening of the gut into the vagina or into the vulva.

Hypospadias results from faulty development or faulty union of the posterior wall of the urethra. In this condition the urinary canal does not end in the meatus just below the clitoris in the middle of the triangular vestibule, but opens into the anterior part of the vulva or of the vagina. Sometimes the hypospadias extends to the bladder so that there is a congenital communication between that organ and the genital tract. In all these conditions there is likely to be relative or absolute incontinence of urine.

Epispadias is a defective closure of the anterior part of the urethra. It is accompanied by splitting of the clitoris, often of the symphysis pubis and, in high degrees, by defect in the anterior abdominal wall or ectopia of the bladder.

Results.—The results of persistent cloaca and of hypospadias are obvious from a consideration of the pathological and anatomical conditions. Feces or urine or both may be passed into the genital passages. Embarrassment and discomfort are certain, and infection of the

genitals is likely. Coitus is not necessarily prevented, but conception is uncommon because of the easy escape of the semen and because of the inimical action of the abnormal contents of the vagina upon the spermatozoa.

Treatment

Therapeutic measures against defective development of the genitals are often of little avail. Nothing can be done for absence or marked hypoplasia of the uterus except castration, which is justifiable only if the moliminal symptoms are severe. The stimulus of sexual congress may cause enough congestion of the infantile or atrophic uterus to make it grow. Perhaps this postmarital development may be sufficient to enable conception and even childbirth to occur. The use of a stem pessary is sometimes advised to create congestion by the irritation of its presence in the uterus. This method is open to the danger of traumatism and of infection. The galvanic current through a stem electrode has also occasionally been employed.

Congenital retroflexion and anteflexion may be treated by dilatation of the uterine and cervical canals. If conception should follow, the resulting pregnancy will usually cure the trouble. The same measures may be used against defective development of the cervix.

For cases of **absence of the vagina** various plastic operations have been devised. In one type of such operations the tissue between bladder and rectum is dissected apart and pedunculated grafts of skin from the labia or thighs are implanted for the purpose of affording a vaginal wall. Another type of operation makes use of a loop of intestine isolated from the rest and brought down to occupy the cavity previously dissected between bladder and rectum. These operations are difficult, dangerous, and usually fail in their object of affording a vaginal canal of any practical value.

A **rudimentary vagina** may be enlarged by passage of graduated dilators and by wearing a glass plug until the object has been attained. The vulva is almost never absent or rudimentary unless the vagina is in similar condition. Therapy is the same for each.

ANOMALIES BY EXCESS

Anomalies of the female genitals by excess include excess in size and in number. Congenitally anomalous **excess in size** of any

of these organs is never of practical moment. Whenever great enlargement of any of them exists it is acquired and is due to neoplasm, other swellings, or infection.

Excess in number applies only to the ovaries and tubes. Duplication of uterus and vagina is due to abnormal development of the muellerian ducts and will be considered in that connection. The structures of the vulva are always normal in number, except that the clitoris is sometimes split into two parts in cases of epispadias.

Supernumerary Ovaries

Etiology.—The existence of more than two ovaries may be due to an excess of developmental material in their anlagen so that more than the normal number exist from the beginning, or to some cause which divides a single one into two or more. Such a cause may be constriction by some abnormal band within the celomic cavity.

Development.—Usually supernumerary ovaries are merely small buds in close proximity to the main organ and apparently pinched off from it, as if by cicatricial formation. This form is called the *accessory ovary*. Rarely the additional ovary is at some distance from the normal ones. It may be remembered that the ovary, like the testis, begins at the side of the vertebral axis near the permanent kidney and migrates downwards to its final normal situation. The supernumerary organ may be left behind in this migration.

Diagnosis.—The supernumerary ovary of either of the above varieties is rare and is seldom recognized except at autopsy or laparotomy. The existence of such additional ovaries explains the occasional persistence of menstruation after the apparently complete removal of both normal organs.

Excess in Development of the Tubes

Tubes vary so much in length within normal limits that it is difficult to say whether any particular tube is excessive or defective in size. Not very rarely tubes are of unequal length.

More than two complete tubes are not recorded. *Accessory ostia,* sometimes with *accessory tubes,* are not very uncommonly observed attached to the main structures like buds or branches. Less often are seen accessory blind tubes connected only with the main tube and without abdominal ostia. These last may have some practical sig-

nificance because they may become lodging places for the impregnated ovum and therefore give rise to ectopic pregnancy.

ANOMALIES BY DEFECTIVE UNION OF THE MUELLERIAN DUCTS

Development

The muellerian ducts develop on either side of the dorsal axis from the mesodermic cells of the wall of the celom as two columns of cells which later become canalized to form tubes. From these primitive tubes arise the oviducts (fallopian tubes), the uterus, and the vagina.

Normally the portions of the duct which are to form the uterus and vagina fuse in the middle and form one tube. Failure of this fusion in different places causes duplication of the organs in varying degrees. Failure of canalization of the ducts causes atresia at the defective places. Absence or rudimentary development of the ducts causes one-sided anomalies of the affected parts of the genital tract.

Complete duplication of the muellerian tract, including tubes, uterus, and vagina, from infundibulum to hymen, is rare. The more common examples of defective union are observed in the uterus.

Double Uterus

Uterus didelphys is the highest degree of duplication of the uterus and means complete separation of the uterine halves from the tubal openings to the external ora. In three-fourths of the cases it is associated with duplication of the vagina. One of the vesico-uterine ligaments usually passes through between the two cervices and continues as the uterosacral ligament. The cause of this anomaly begins early in embryonic life and depends upon an abnormally wide separation of the muellerian ducts. Often the pelvis is wider than normal. The anomaly is very rare and usually accompanies other malformations of grave character incompatible with continuance of life.

Menstruation is not disturbed and conception may occur as readily as in normal cases, but full-term *pregnancy* is less likely because the thinner walls of the pregnant half will not stand distention so well as the normal organ. Therefore premature emptying of the uterus is to

be feared. *Coitus* is not impaired unless the duplication of the vagina contributes an obstacle.

The **diagnosis** is made by discovery of a double vagina or two cervices and by palpation of the double uterus during bimanual examination. A broad pelvis will be a further diagnostic point.

Fig. 55.—Uterus didelphys.

Fig. 56.—Uterus bicornis.
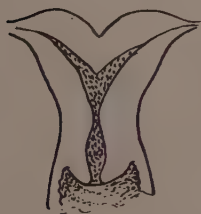
Fig. 57.—Uterus arcuatus.

Fig. 58.—Uterus septus.

Fig. 59.—Uterus unicornis.

Fig. 60.—Uterus with rudimentary horn.

Uterus bicornis is a lesser degree of duplication than the preceding. The two muellerian tubes lie close enough together so that a single cervix and often part of a single body exist. The upper portion of the body of the uterus is double like the uterus of most of the mammals.

In some cases a septum exists through the cervix and occasionally there are two external ora but the duplication is not so perfect as in true uterus didelphys. This form is called **uterus bicornis bicollis**. Sometimes there is a partial or complete septum in the middle of the vagina. In the **uterus arcuatus** the only evidence of duplication is a depression in the middle of the fundus. **Uterus septus** is nearly normal in external aspect but has a thin septum in the middle.

Except that there is a tendency to premature delivery, the normal functions of the uterus are usually preserved in the uterus bicornis. The placenta may be implanted upon the septum in uterus septus and its removal may wound the septum.

Uterus unicornis is developed from one half of the muellerian duct, while the other half is wanting. The whole duct of the affected side may be lacking, in which event there will be no tube on that side, and the vagina will be of smaller caliber than normal. The tube of the defective side is usually absent but the vagina is usually normal. Both ovaries are usually present.

The physiological functions of the uterus unicornis are generally undisturbed, except that the pregnancy is less likely to go to full term.

The **diagnosis** is difficult both in the pregnant and the nonpregnant state. It is usually made during operation or at autopsy.

Uterus with rudimentary horn is a uterus unicornis with the other horn slightly developed and not communicating with the cavity of the perfect half. Such a rudimentary horn may become filled with menstrual blood and form a cyst of considerable dimensions. This will usually be taken for a cyst of the ovary or tube and may only be recognized on operation. In most instances, however, the rudimentary horn has such a maldeveloped endometrium that little or no menstruation occurs.

Occasionally, indeed, pregnancy takes place in such an isolated horn. The course of such a pregnancy is much like that of tubal gestation, except that rupture of the sac may not occur until late. The **treatment of pregnancy in a rudimentary horn** is the same as for true ectopic pregnancy, for which it is usually mistaken. It consists in laparotomy and removal of the entire gestation sac. Sometimes the whole uterus must be removed.

Duplication of the Vagina

Double vagina may exist with double or single uterus. The duplication may be from a complete double vagina with two canals, two vaginal walls, and two hymens, which is the rarest, to the commoner form of a partial septum of thin texture. The septum may exist in any part of the vagina. Often it is represented by a small bridge of mucous membrane on one side of the canal.

Results.—Septate vagina may interfere with coitus or the septum may be torn and bleed freely. It sometimes offers an obstruction to the passage of the fetus, but usually it is torn away without much difficulty or is pressed to one side and the fetus passes through one side of the canal.

The **diagnosis** of duplication of the vagina is made accidentally during examination for other reasons or is suggested by a history of difficult coitus. Digital examination will reveal the condition and the speculum will confirm the diagnosis.

No **treatment** is needed unless coitus is impossible, or the septum is causing obstruction to labor. If necessary from these reasons the septum may be incised and bleeding points tied.

HERMAPHRODITISM

True hermaphroditism means the condition of both sexes in the same individual. There must be ovaries and testes, both functionating, as well as external appearances of both sexes. In the human species no true hermaphrodite has been reported.

Pseudohermaphroditism means the external appearances of one sex in an individual who is actually of the opposite sex. A *male pseudohermaphrodite* has testes but has external sexual organs which resemble those of the female. For example, he has hypospadias with rudimentary penis, a genital cleft which may resemble a vulva, sometimes traces of a vagina and sometimes undescended testes. Therefore the external organs bear more or less resemblance to those of the female.

A *female pseudohermaphrodite* has ovaries, but has external sexual organs which resemble those of the male. For example, she has a hypertrophied clitoris, a rudimentary genital cleft and vulva, some-

times almost no vagina and sometimes ovaries descended into the labia majora so as to resemble testes.

The general or so-called **secondary sexual characteristics** are usually present to greater or less degree. A male hermaphrodite often has full breasts, rounded limbs, scanty beard, high pitched voice, and other characteristics of the female besides the feminine appearance of the external genitals. The female hermaphrodite often has undeveloped breasts, more angular and muscular limbs, unusual development of hair upon the face, coarse voice, and other characteristics of the male besides the masculine appearance of the external genitals. In other words the condition of hermaphroditism seems to be more or less of a general state and not merely a condition of anomalies of the sexual organs.

Male pseudohermaphroditism is much more frequent than female. In case of *doubt as to diagnosis* of sex, the physician or accoucheur should pronounce the child male and it should be reared as a boy until later developments, perhaps at the time of puberty, call for a change in diagnosis.

More detailed consideration of this subject belongs to treatises on Teratology and Genitourinary Surgery.

CHAPTER VIII

UTERINE DISPLACEMENTS

The uterus is not a fixed organ. It floats free in the pelvic cavity, anchored by the broad ligaments, the round ligaments, the sacrouterine ligaments, and by its attachments to the bladder and vagina. Its lower portion is in close relation to the bladder anteriorly. In the standing or sitting posture, it lies over the empty bladder, but is pushed upwards and backwards as the latter organ fills. The position and posture of the uterus is influenced also by the fullness of the rectum.

Etiology

The uterus is held as in a sling by the broad ligaments and, with the other contents of the pelvis, is supported by the pubococcygeus muscle and the other structures of the pelvic floor. As the intraabdominal pressure changes with the motions of the woman and with respiration, the pelvic diaphragm moves up and down and the uterus and other pelvic contents move with it.

When the support of the pelvic floor is faulty and the ligaments are lax, the uterus, with the other pelvic contents, becomes *prolapsed* and settles to a level lower than normal. As the uterus travels down the pelvic cavity, it follows the curve of that canal and therefore becomes retroverted as it prolapses. This phase of this subject is explained in the chapter on Gynecological Hernia.

Tumors of various kinds within the pelvis may displace the uterus by encroachment. This phase of the subject is considered in the chapter on Neoplasms.

Adhesions and other cicatricial formations, resulting from infection or from operations may pull the uterus in various directions and cause many kinds of displacement. Abscesses and exudative masses confined in the pelvis may at first push the uterus out of place. Later the contraction of the resulting cicatrices may pull it out of place.

A certain number of displacements of the uterus remain which can not be included in any of the above etiological classes. These are

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mostly due to *congenital anomalies,* such as defective development of the uterine wall or faulty development of the uterine ligaments. This class of uterine displacements will be considered here. They are sometimes called the simple displacements of the uterus.

Fig. 61.—Intraligamentous myoma displacing uterus laterally.

Fig. 62.—Contracting scar tissue displacing uterus laterally.

SIMPLE UTERINE DISPLACEMENTS

Classification

Uterine displacements are usually divided into *versions, flexions, and prolapse.* The last is considered elsewhere because, although sometimes due to congenital maldevelopment of the muscular structure of the pelvic floor, it belongs in the class of gynecological hernia.

Versions and flexions may be towards the front, the rear, or one side. Therefore we speak of anteversion, retroversion, and lateroversion; anteflexion, retroflexion and lateroflexion. In *version* the axis of the uterus remains straight, but its direction is abnormal. In *flexion* the axis of the uterus is bent.

The uterus is often both retroverted and retroflexed. Normally it is anteverted and slightly anteflexed. It is difficult to conceive of an abnormal anteversion, but abnormal anteflexion is not uncommon. Simple lateroversion and lateroflexion are rare.

For practical purposes the simple displacements of the uterus may be divided into *retroversion, anteflexion, retroflexion,* and *retroversio-flexion.*

RETROVERSION

In **simple retroversion** of the uterus, the organ is tipped backwards beyond the vertical line of the body erect. As already stated,

Fig. 63.—Retrodisplacements of uterus. *A,* normal position; *B,* retroversion; *C,* retroflexion.

retroversion is usually part of the phenomena of prolapse. Sometimes, however, there is a backward displacement of the uterus without any defect in the supporting structures of the pelvic floor or of the uterus. The condition is probably congenital. It is probably not of pathological significance, although the profession has been slow to arrive at this conclusion. Indeed, the old idea that numerous reflex

disturbances may be the result of simple retroversion of the uterus still seems to be deeply rooted in the minds of many physicians.

It can not be proved that the condition causes any **symptoms.** It is true that the patient may present manifold subjective symptoms, chiefly of a neurotic character, and at the same time may have a retroverted uterus of the simple variety, but the symptoms and the retroversion are merely coincident. When the retroversion is an accompaniment of prolapse, of cicatrization, or of other pathological processes, the symptoms are not due to the retroversion, but to the accompanying pathological process.

The **diagnosis** of retroversion is made by bimanual examination. The internal finger comes in contact with the cervix lying directly in the line of the vaginal canal. Passing along behind the portio vaginalis, the finger feels that the body of the uterus continues backwards in line with the cervix. At the same time the external fingers upon the abdomen fail to find the fundus in its normal position just behind the symphysis. The combined manipulation compresses the uterus between the examining fingers with the cervix pointing anteriorly instead of the fundus, as in the usual position. The body of the uterus is not felt between the fingers in front but to the back part of the pelvis.

Unless the retroverted body of the uterus is imprisoned between the two sacrouterine ligaments, the retroversion can usually be temporarily reduced during the bimanual manipulations. It falls back into the abnormal position as soon as it is left to itself.

No **treatment** is required by this condition unless complicated by prolapse or by cicatrization. The reader is referred to the parts of this book which treat of these subjects.

ANTEFLEXION

In simple anteflexion of the uterus the organ is bent forwards upon its longitudinal axis so that the kink comes somewhere in the corpus uteri.

The condition is *congenital* and is due to a defective development of a portion of the anterior wall of the uterus. At this point there is more of the fibrous element of the uterine wall than of the muscular element. The rest of the uterus may be fairly well developed so that it grows beyond the rate of growth of the anterior portion and so causes

a bend. The canal of the uterus is bent and perhaps somewhat occluded like a bent rubber tube. The wall at the point of flexion is somewhat thinner than the rest, and under the microscope shows a preponderance of connective tissue cells and fibers.

The **results** of simple congenital anteflexion are a tendency to sterility because of difficulty in the passage of the spermatozoa, a tendency to abortion because of the defective development of the uterus, and dysmenorrhea.
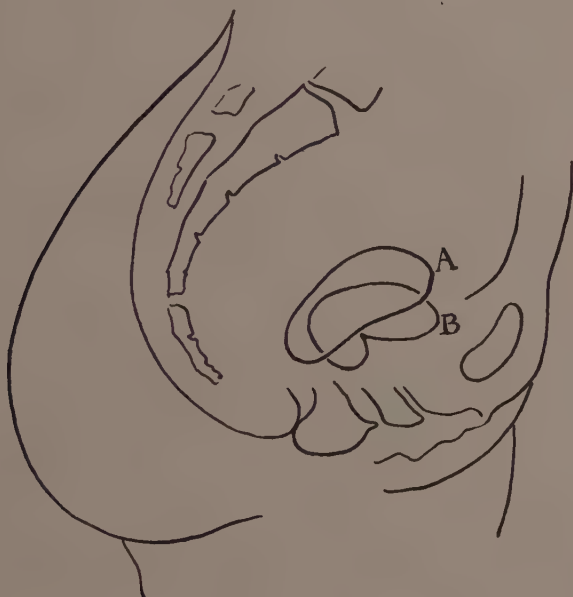
Fig. 64.—*A*, normal position; *B*, anteflexion.

The **diagnosis** is made from the history of *dysmenorrhea* and from *bimanual examination*. The pain is usually manifested at the beginning of menstruation, during the congestive stage, and is likely to diminish and cease soon after the flow is established. It is uncommon for clots to pass.

Bimanual examination shows the cervix normally situated or turned somewhat forwards, with a sharp bend in the anterior aspect of the uterus. The upper portion of the corpus and the fundus are felt forwards and the internal finger feels the sharp kink.

Pathology.—The dysmenorrhea which is so characteristic of

both anteflexion and retroflexion seems, on superficial view, to be due to the retention of the menstrual fluids above the bend. This view is supported by the facts that the pain comes before the bleeding and seems to be relieved by the bleeding. It seems as if the uterus contracts painfully in order to expel the menstrual fluids and that, after the obstruction has been overcome, the pains cease.
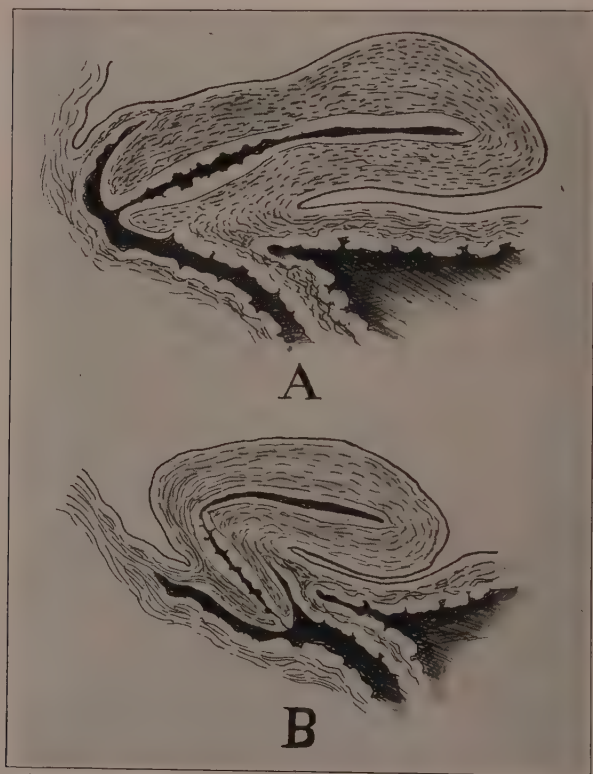
Fig. 65.—*A*, normal uterus; *B*, immature, acutely anteflexed uterus.

On the other hand, it has been proved by the passage of the uterine sound that the stenosis at the bend is less during the congestive stage of menstruation than at other times. Therefore the dysmenorrhea can not be due to the stenosis. During the congestive stage of menstruation the whole uterus enlarges because of the increased supply of blood at that time. Pressure of the blood within the dilated vessels

and of the fluids exuded into the tissue spaces causes disturbance of the terminal filaments of the nerves within the uterine wall.

At the point of the maldevelopment, the muscular tissue is faulty and the tissues can not stretch as well as elsewhere. Hence the nerves are compressed and pain results. As the congestive stage yields to the degenerating stage of menstruation, the bleeding occurs, and at the

Fig. 66.—Palpating anterior surface in anteflexion. ·

same time the pressure upon the nerves is relieved. Hence the dysmenorrhea gradually declines and disappears.

RETROFLEXION

Simple retroflexion of the uterus is a bending backwards of the organ upon its longitudinal axis. It is due to faulty development locally in the posterior wall. The results are similar to those of anteflexion or of lateroflexion. The condition is less common than simple anteflexion.

The **diagnosis** is made, as in anteflexion, by the symptoms and bimanual examination. The external hand fails to feel the fundus in the normal situation. The uterus can not be palpated between the external hand and the internal finger with the fundus pointing forwards as in normal anteversion. Instead the cervix is felt in the normal place or slightly turned forwards, and the body and fundus are felt behind the cervix and deep backwards in the pelvis.

The condition may be mistaken for prolapsed ovary (into the cul-de-sac) enlargement of the tube or a small posterior fibromyoma. The differentiation is made by recognizing that the uterine body is not to be felt in its normal position and that the rounded object felt behind is closely connected with the cervix, indeed, is a continuation of it. Rectal examination will often be a valuable aid in the diagnosis.

Retroversioflexion

Simple retroversioflexion is a combination of a tipping backwards of the axis of the uterus beyond the vertical line of the body erect, and a backward bend in the axis.

What has been written about retroversion and retroflexion applies here, except that bimanual examination finds the cervix pointing well forwards and the fundus deep in the cul-de-sac between the vagina and rectum.

Treatment of Simple Displacements

Since these displacements frequently are accompanied by no symptoms which can logically be attributed to the condition, it is often unnecessary to treat them at all. Sometimes, when a neurotic woman has been told that she has a displacement of the womb, she develops a set of subjective symptoms which demand suggestive treatment. Such treatment may sometimes be supplied by a pessary or even a pretended operation. The main reliance is upon the suggestive factor.

The flexions which are accompanied by severe *dysmenorrhea* may require treatment for that symptom. The main effort will be to stimulate development of the uterus.

Heat in the form of hot douches, hot packs, warm enemas, and hot baths will usually relieve the acute condition, and, if persisted in, will often permanently benefit the case.

Galvanism through the uterus by using one electrode in the vagina and the other upon the abdomen may be useful.

The **marriage** relation often effects a cure. Pregnancy to term usually results in complete recovery from the symptoms and from the maldevelopment itself. Active hyperemia is the keynote in these forms of treatment.

Operative procedures of a radical character are seldom justifiable. Numerous operative gymnasts have devised fearful and wonderful operations, most of them based on a false notion of pathology. Among such are those operations which consist in cutting out a wedge-shaped piece from the side opposite the bend and suturing so

Fig. 67.—Diagram showing pulley action of pessary. Arrows indicate direction of force.

as to shorten the opposite wall in the hope of straightening out the kink in the maldeveloped portion of the uterine wall.

Dilatation by means of the Hegar instruments or those of the branching type will often give good results. Sometimes the dilatation must be several times repeated. **Curettage** may act well because of the hyperemia which follows.

Pessaries were much in vogue by the past generation of gynecologists for the treatment of the simple displacements. A retroverted uterus may be reduced by manipulation and may be held in the normal position by means of a properly fitted pessary. *The Hodge type* of pessary is used for this purpose. This is an irregularly shaped ring of hard rubber. Viewed in one aspect, it is about twice as long as it is broad and rather wider at one end than the other. Viewed from the

lateral aspect, the pessary is shaped like a letter S, but with less pronounced curves. The arm of the S which corresponds to the broader end of the pessary is longer than the opposite arm.

The instrument is inserted into the vagina on the flat until the broader end reaches the anterior part of the cervix. Then the index finger passed through the ring pushes the upper end backwards, past

Fig. 68.—Showing manner in which wide bow of pessary encircles cervix, while narrow bow rests on anterior vaginal wall opposite internal meatus.

the cervix so that that end fits into the posterior vault of the vagina. The lower end, the narrower and the smaller arm of the S, reaches to the anterior wall of the vagina behind the pubes and near the urethra. The pessary rests, like a rocker, upon the posterior vaginal wall as a support and pushes upwards on the sacrouterine ligaments causing them to pull upwards and backwards upon the cervix and thus to keep the uterine axis tilted forwards.

The pessary is needless, but comparatively harmless, in cases of simple retroversion, but is sometimes indicated in some of the retroversions with prolapse. If the laxity of the pelvic floor is not marked, the pessary may hold the uterus and the upper vagina up to a healthy level and prevent for a time further extension of the hernial protrusion of the uterus through the vaginal canal.

CHAPTER IX

INJURIES OF THE FEMALE GENITALS

Traumatism of the female genitals may be conveniently divided into that resulting from pregnancy, labor and the puerperal state; that resulting from coitus; that resulting from therapeutic measures; that resulting from foreign bodies; that resulting from accident; and genital fistula.

INJURIES RESULTING FROM PREGNANCY, LABOR, AND PUERPERAL STATE

Laceration of the Perineum and Pelvic Floor

In respect to their sequelæ the most important of all the injuries of the female genitals are those of the perineum and floor of the pelvis, especially the latter. A large part of gynecological practice consists in their study and care.

ETIOLOGY

The cause of these lacerations is *disproportion* between the fetal head and the vulvovaginal canal, at the moment of passage. This disproportion may be because the head is absolutely too large for the outlet of the genital canal; because forceps or other instrument encroaches upon the diameter; because the head is not coming in a favorable position, or is accompanied by a prolapsed member; because the passage is so speedy that the soft parts have no time to become softened and elastic; because anomalies of the bony canal or of the uterine position force the head irregularly and unduly against the posterior vaginal wall and the perineum; or, because previous interference by the hands, forceps, or other means has resulted in a preliminary injury to the canal.

It is true that the breech when presenting sometimes tears the perineum and that the shoulders occasionally tear it although the head has passed harmlessly, but the head, as the largest portion of the fetus, usually causes the lacerations of the maternal passages.

The **direction of the expelling forces** upon the fetus is perpendicular to the plane of the superior strait and the direction of passage of the presenting part out of the vulvar orifice is in an entirely different line. In other words, the presenting part is pushed around a
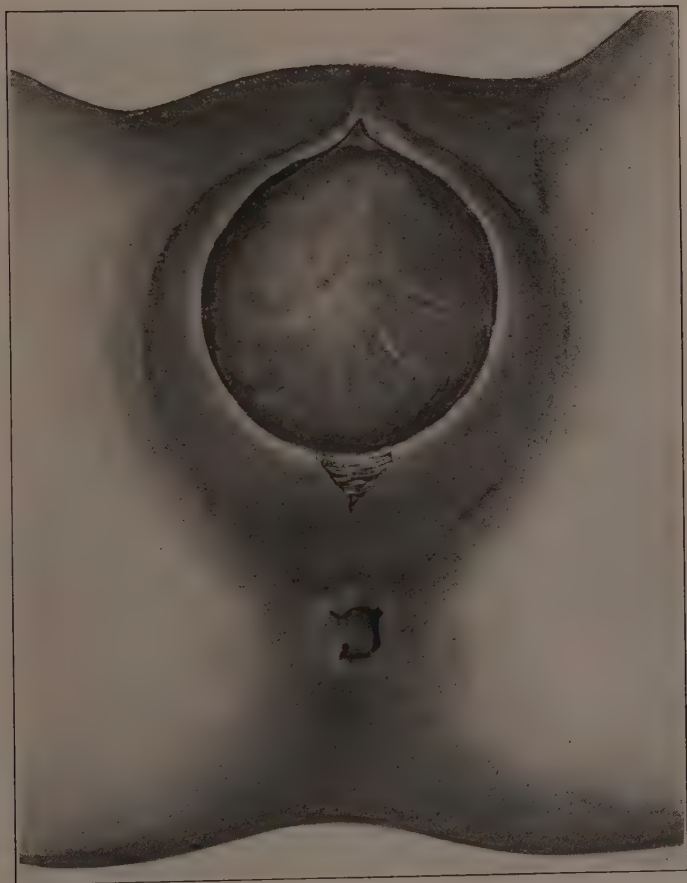
Fig. 69.—Beginning median laceration of perineum.

rather sharp curve as a train is pushed by a rear locomotive around a curved track. Therefore there is great pressure upon the posterior part of the parturient canal by the presenting part just as the first car of the train presses especially upon the outer rail of the curved

track. Thus is explained the reason why the posterior vagina and the perineum are most often torn in labor.

The **first tear in the mucous membrane** may be at the fourchette, or may be in the posterior vaginal wall. The passage of the chin, shoulders, and body of the fetus may extend a tear already begun by the head. Küstner considers that most perineal tears begin as tears within the vagina. This opinion is supported by the fact, observed by all obstetricians, that a new show of blood appears just before the birth of the head in most of those cases where a laceration of the perineum finally occurs. This blood, appearing while the fourchette is still intact, indicates that the vaginal wall is already wounded.

Classification

It is customary to classify perineal lacerations in three degrees. In the **first degree,** the tear in the skin of the perineum extends less than half way between the fourchette and the anus. In the **second degree,** to the margin of the anus; in the **third degree,** called a complete tear, through the anus, involving much or all of the sphincter muscle. Such a classification is based in some measure upon the severity of the traumatism, but fails to take into consideration the amount of laceration of the posterior vaginal wall and consequent injury to the pelvic floor.

Even a complete laceration of the perineum may not be deep enough internally to injure seriously the fibers of the pubococcygeus and the other structures of the pelvic floor. On the other hand, there may be deep and extensive wounding of the structures supporting the pelvic floor without much or any injury to the skin of the perineum.

Mechanism of Lacerations

The tear is usually Y-shaped. The laceration of the skin of the perineum is nearly straight in the median line, but the deeper lacerations into the posterior wall of the vagina run to one or both sides. The mucous membrane of the posterior vaginal wall is tough and elastic in the region of the columnæ rugæ, but is much thinner at the lateral sulci.

Let us recall the H-shaped cross section of the vagina just above the hymen. The tear extends into one of the lower arms of the H. If it extends far enough, it will separate some of the muscular fibers of

the anterior portion of the sling made by the puborectal portion of the pubococcygeus. To the extent of this tear into the muscle will be the damage to the pelvic floor. The tear usually runs into both

Fig. 70.—Diagram showing structures involved in perineal lacerations: *AA*, median lacerations; *BB*, deep oblique lacerations.

posterior sulci but is generally more extensive on the left side because of pressure by the occiput. An extensive tear of the levator may exist without any evidence of external injury. This condition has been described as *relaxed perineum*.

Median lacerations may be described as complete and incomplete. An **incomplete laceration** may extend into, but not through, the sphincter ani. It causes no permanent damage except to the pulchritude of the parts. A **complete laceration** involves not only the internal and external sphincters but may extend a variable distance along the rectovaginal septum. An incomplete laceration causes no symptoms; a complete laceration causes impaired bowel control but does not cause prolapse. Deep oblique tears into the levator ani and its fascias result in prolapse of the pelvic structures but

Fig. 71.—Diagram showing *A*, incomplete laceration; *B*, complete laceration of perineum.

not in impaired bowel control. It is possible for lacerations of the perineum and the pelvic floor to coexist, but it must be remembered that they are not necessarily combined.

DIAGNOSIS

The diagnosis of laceration of the perineum is usually made by the obstetrician at the time of delivery. In most instances he sees the accident occur. Otherwise he spreads the thighs so that he can view the parts, wipes away the blood, and separates the lips of the vulva. The direction of the laceration is usually in the form of a Y, with arms of irregular length. On account of contraction of the lacerated tissues, the edges of the ragged wound are separated so that a triangle or butterfly of raw surface appears. Unless there is an unusually deep tear into the posterior wall, there is not likely to be much hemorrhage.

It is easy to distinguish the perineal skin from the wounded tissues, but rather difficult to differentiate the bruised and cyanotic mucous membrane from the wounds. The patient should be so placed that a good light shines upon the genitals. The parts should be wiped clear
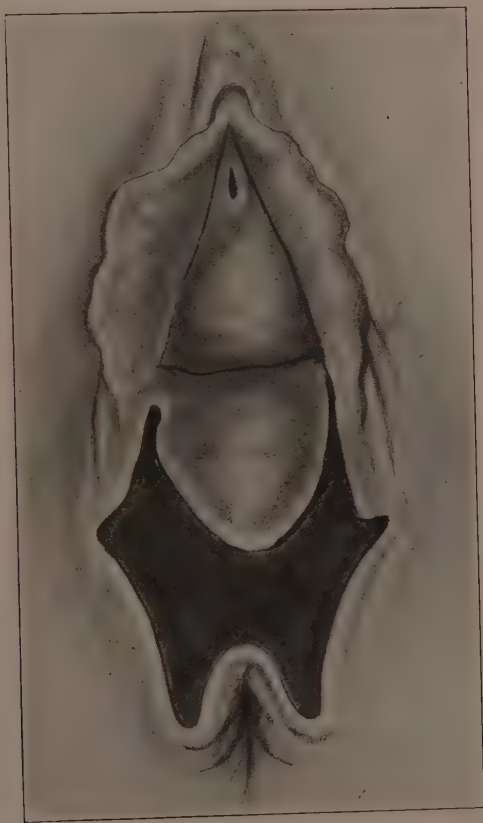
Fig. 72.—Complete perineal tear.

of clots, meconium, vernix, and other extraneous material. With such precautions, a good view can be obtained and the extent of the injuries can be determined.

If one has not examined and found a laceration, its presence may be revealed by the pain caused by the first passage of urine over the raw surface.

Lacerations of the perineum may heal spontaneously, but always with more or less deformity, due to retraction of severed muscles and to cicatricial contraction. After healing of such lacerations, the
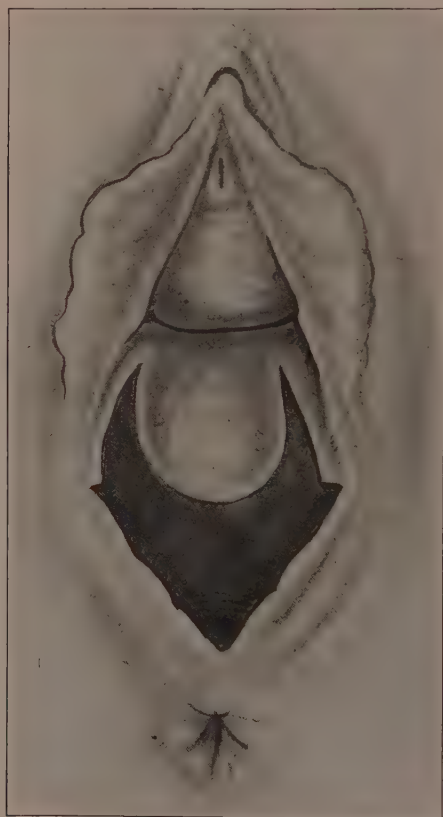
Fig. 73.—Deep perineal tear.

vulvar outlet is always wider than before. The more extensive the tear of the pelvic floor, the more extensive will be the prolapse of the anterior and posterior walls of the vagina. When the prolapse is considerable, part of bladder may be contained in the anterior prolapse (*cystocele*) and part of the anterior wall of the rectum in the posterior prolapse (*rectocele*). When the tear has not extended far into the

vaginal wall and the pelvic floor has consequently been little injured, an extensive tear of the perineum may occur without marked prolapse.

When the laceration of the perineum has been *complete*, there will be incompetency of the sphincter ani to a degree dependent upon the injury to its fibers. All the wounded surfaces will become covered over with mucous membrane or skin, but the genital outlet will be widened and the parts will be more or less distorted by the contraction of scar tissue.

Fig. 74.—Sagittal section showing cystocele and rectocele.

The prolapse of the vaginal walls and of the pelvic contents may not become noticeable for a considerable time. The other conditions for the formation of a hernia of the pelvic contents through the weakened and stretched supporting structures of the pelvic diaphragm may not be present. These conditions are sufficient abdominal pressure and weakening of the ligamentary supports of the pelvic organs. The potentialities of a hernia are present from the time of appearance of the laceration. This subject will be further discussed in the chapter on Gynecological Hernia.

The treatment of lacerations of the perineum and pelvic floor is twofold; *primary or immediate,* and *secondary.*

The **primary treatment** calls for an immediate repair of the lacerations unless contraindicated by a bad general condition of the patient, insufficient equipment, poor lighting facilities, or other outside circumstances.

The **reasons for primary repair** are to restore the cosmetic appearance, to restore the complete functions of the vulva and vagina as pars copulationis, to stop hemorrhage, to prevent hernia, and to prevent infection of the wounds. However complete may have been the aseptic and antiseptic precautions, it is impossible to prevent absolutely the presence of microbes within the folds of the vulva and in the skin of the perineum. In addition, the position of the anus within such a short distance of the lacerated wound, covered as it is by the same vulvar pad, offers great chances of infection of an open wound of the perineum. On account of the rich supply of blood and lymph vessels, infection of the perineal wound is very likely to extend.

Technic of Primary Repair.—When the patient's hips have been drawn to the edge of table or bed, the parts are in a good light, instruments and suture materials are sterilized and handy, and the operator is comfortably seated, the repair may begin. The vulva and the wounds should be sponged dry so that the operator may be able to distinguish the raw surfaces from the bruised and reddened mucous membrane. If there is enough hemorrhage from above to obscure the field, it is permissible to place a piece of gauze in the upper vagina until the suturing has been finished.

One must study the lacerations and try to replace the parts as they were before. Sometimes there are ragged edges which must be trimmed. Occasionally bleeding arteries must be caught and tied. The sutures must be so placed that the original Y line of the lacerations is restored in the final line of suturing. On the sides of the posterior vaginal wall, in the upper arms of the Y, the sutures must be placed deeply so as to catch up the pubococcygeus muscle and its fascia.

The rectum must be depressed by the finger in the median line while passing the sutures, so that it may not be wounded. If a stitch is passed into the rectum it is probable that a rectovaginal or rectoper-

ineal fistula will result. If the tear is extensive and deep in the vaginal wall it may be necessary to use layers of buried sutures.

When the upper arms of the Y are properly closed, the pelvic floor is restored. The shank of the Y is then sutured, sometimes in layers, sometimes with sutures passed through the skin and deeply on either side, so as to bring the whole wound together, depths and surface.

If one is sure that he is using a catgut which will last in the tissues of the puerperal perineum and vagina for ten days or more, catgut is the material of choice. Catgut is usually labeled according to the number of days it will remain unabsorbed in muscular tissue; ten-day, twenty-day, or forty-day catgut. The lochial secretions will cause disintegration of catgut four or five times as quickly as will muscle.

If not sure of his catgut, it is best for the operator to use silkworm gut for the sutures through the skin and mucous membrane, and catgut only for the buried sutures. It is well to leave the ends of the silkworm gut long. The ends may all be tied together and placed within the vagina. Thus there will be less irritation than if they are cut short. The sutures should be removed within ten days.

If the laceration is complete (through the sphincter ani) the operation of repair must be modified to include proper closure of the rectal wound. First one unites the wound in the rectal mucous membrane. This is best done by passing a through-and-through suture along the margin of the torn rectal lining so that the edge of the wound is brought out to the anal margin. This is better than to unite the rectal mucous membrane by interrupted sutures which are left within the rectum. The lining of the rectum is usually abundant and elastic enough to be easily brought down by the suture to the anal margin. This procedure lessens the chance of infecting the sutured wound from the contents of the rectum.

Next the ends of the torn sphincter must be found and brought together in front of the rectum by deep buried sutures into the muscle. The laceration is thus changed from a complete to an incomplete one. After this the rest of the perineum is united as already described.

In most cases lacerations of considerable extent should be repaired under *local or general anesthesia*. The operator is much hindered if the patient is tossing about while he is attempting to pass the sutures.

Usually it is convenient to do the suturing under the same anesthesia which has been employed for the last stage of the labor.

It is not necessary to wait for the delivery of the placenta. Its subsequent passage will not harm sutures properly placed. If one should be forced to resort to manual removal of the placenta, of course he will be obliged to cut his sutures and to replace them. This involves no more time or inconvenience than if he had waited for the delivery of the placenta before placing his sutures.

After-Treatment.—The treatment after immediate perineal repair differs little from that proper after any puerperium. Unless the patient is very unruly, there is no need of tying the knees together. Sutures properly placed and of proper strength and endurance will not be injured except by most violent conduct on the part of the woman. It must be remembered that wounds will always heal unless they become infected. If the obstetrician is accustomed to allow his patients to get up soon after labor he may do so even after repair of the perineum.

The *bowels* may be moved as if there were no sutures. It often happens that irritation of the sutures causes spasmodic retention of *urine* for a few days. Every means should be used to cause the patient to pass urine herself, before resorting to the catheter. Such means are warm sterile water poured over the pubes and vulva, hot fomentations to the lower abdomen, warm enemas, and allowing the woman to sit up on the vessel.

Secondary repair will be considered in the chapter on Gynecological Hernia.

Lacerations of the Anterior Vagina and Vulva

Etiology

Injuries to the anterior portion of the vagina or vulva are less common as results of labor than injuries to the posterior portion. The pubic bones in most instances prevent the presenting part from tearing the anterior commissure of the vulva. Sometimes too vigorous efforts at supporting the perineum by pressing the head too strongly forwards will cause anterior tears. Such usually occur in the labia minora and between them and the vestibule at the side of the urethra. In the latter situation lacerations are especially likely to cause hemor-

rhage from the wounded veins of the bulbar plexus. The forceps blades are sometimes the agents which start the tears.

Hematoma.—Sometimes there is little or no laceration of the mucous membrane of the anterior vulva or vagina but there may be so much bruising from excessive pressure that the blood vessels rupture under the unwounded mucous membrane or even under the skin of the labia majora. The effused blood may produce extensive hematomata, sometimes called thrombi of the vulva or of the vagina.

Occasionally the advancing presenting part, or the blades of the forceps may tear the vaginal walls in the upper or middle third. Hemorrhage is sometimes excessive. Rarely the laceration will extend into the rectum or bladder, or even into the peritoneal cavity at the cul-de-sac of Douglas.

TREATMENT

All lacerations of the vulva or of the lower portion of the vagina should be sutured at once to stop hemorrhage and to prevent infection. Lacerations of the anterior portion very seldom run deep enough towards the sides to invade the fibers of the pubococcygeus so as to impair the integrity of the pelvic floor.

Lacerations of the upper vagina, like those of the cervix, should be sutured only if they are the sources of excessive hemorrhage.

Hematomata and thrombi of the vulva and vagina, if they are very large, or if the skin or mucous membrane over them appears so badly bruised that it threatens to become necrotic, must be incised, cleared out, and drained. Unless the tumor is so large that the integument over it seems on the point of bursting, it is better to wait for the contents to become absorbed. When infection of the swelling occurs, incision and drainage are necessary.

Lacerations of the Cervix

The tissue of the cervix uteri is torn in some degree in every case of labor at full term and in most cases of premature labor and abortion.

ETIOLOGY

The cause of the lacerations is the relative disproportion between the size of the body passing through and the dilatability of the cervical tissues.

At full term the painless contractions of pregnancy have already prepared the cervix for dilatation. Even at this time, however, the extreme stretching of the tissues by the advancing fetus always tears the cervix to some appreciable extent. The external os never recovers the rounded contour which it possessed in the nulliparous state.

In premature labor and in abortion, the size of the object passing through the cervical canal is much less than a full term head, yet even in early abortions, it is the rule to have some laceration of the region around the external os. The cervix, during the earlier months of pregnancy, is not prepared for dilatation and is therefore easily torn by the quick passage of the ovum or embryo.

Lacerations of the cervix may be *classified* as lateral, bilateral, anterior, posterior, or stellate. For all practical purposes, we may consider the bilateral lacerations only, because they are the most common and because the same principles of etiology, pathology, and treatment apply to them as to the rarer varieties.

MECHANISM

The reasons for the disproportion between the size of the presenting part and the dilatability of the cervix are, on the one hand, rigidity or faulty dilatability and, on the other hand, great size of the fetus or rapidity of passage. To these must be added the injuries of the cervix due to forceps, to artificial dilatation, or to too rapid extraction.

The cervical ring tears at the lateral margins, and the tear extends through the portio vaginalis towards the uterus and towards the junction of the uterus and vagina. The laceration is usually deeper on the left side than on the right. There is always some hemorrhage, which is greater the more extensive the tear. Bleeding, however, is seldom very profuse from laceration of the cervix unless the tear has extended far enough to wound a large branch of the uterine artery. In such a hemorrhage, the blood flows both during and between the pains, and can thus be distinguished from postpartum hemorrhage from the placental site. It is seen to flow even when the uterus is firmly contracted.

PATHOLOGY

The tendency is for the lacerated cervix to *heal spontaneously*. As the cervical muscle retracts and as the upper vagina becomes con-

tracted after labor the severed parts of the cervix tend to come together and to be held as in a splint by the enveloping vaginal canal. Unless infected, the wounded cervix usually heals without disturbance.

Fig. 75.—Bilateral laceration of cervix. (From wax model in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)
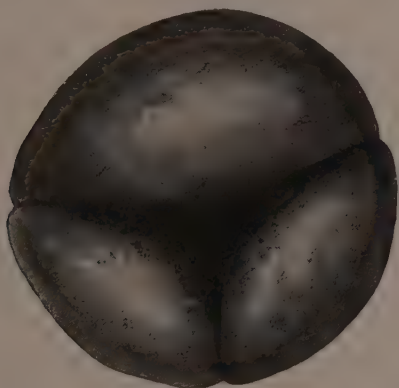
Fig. 76.—Stellate laceration of cervix. (From model in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

When infection has reached the upper vagina during labor or shortly afterwards, the lacerated wounds of the cervix offer a favorable ground for its extension. The infection may cause no more harm than to prevent healing by first intention. Therefore healing will take place by *granulation*. This means that the squamous stratified

epithelium of the portio will grow over and cover the raw surfaces. This sort of healing leaves an angular gap extending from the widened os and splitting the portio.

Since *the laceration is usually bilateral,* there will be a gap on each side, leaving an anterior and a posterior lip of the permanently divided cervix. The ciliated columnar epithelium of the endocervix will be exposed in the median line of the internal aspect of these lips. When the original lacerations have been multiple, the portio will be divided into several irregular lips separated by·slits radiating from the margin of the os. This last is the *stellate laceration.*

When the infection has subsided, and the healing has become complete, the portio may remain in this split condition without further deformity or other anomaly. If much cicatricial tissue has formed, as is usual when the lacerations have been extensive, the resulting contraction may interfere with the venous and lymphatic return from the portio. Then the lips of the lacerated cervix may become edematous and finally permanently *hypertrophied.*

The mucous membrane of the endocervix may become everted and exposed to contact with the vaginal walls and with the glans penis. A catarrhal endocervicitis will ensue on account of the passive hyperemia of the cervix or on account of chronic infection to which the exposed tissues will be liable.

Chronic infection, instead of coming after the healing of the lacerations has taken place in the manner described, may merely be a persistence of the original infection which prevented primary union. Chronic infection, inflammation and hypertrophy may persist indefinitely and give rise to troublesome symptoms. Very often the same infection of the cervix will have reached the rest of the uterus and will have caused subinvolution. At all events, the chronic infectious process in the hypertrophied cervix may cause general symptoms due to absorption of toxins, similar to those caused by a chronically inflamed tonsil or other infection-atrium.

DIAGNOSIS

The endometritis and the endocervicitis will cause discharge of mucus or pus in considerable amounts. Dysmenorrhea and menorrhagia are to be expected. Slight bleeding after coitus or following the douche is frequent. Erosions about the os are the rule. Occlusion

of the cervical glands causes formation of numerous retention cysts (ovula Nabothi).

Sometimes the speculum picture of a chronic hypertrophied lacerated cervix is that of two immense lips, dotted with little shot-like cysts and covered externally with the red velvety erosions. Thick cloudy mucus is seen exuding from the cervical canal. Often the discharge will have a purulent appearance. Frequently the enlarged cervix will exceed in size the body of the uterus.
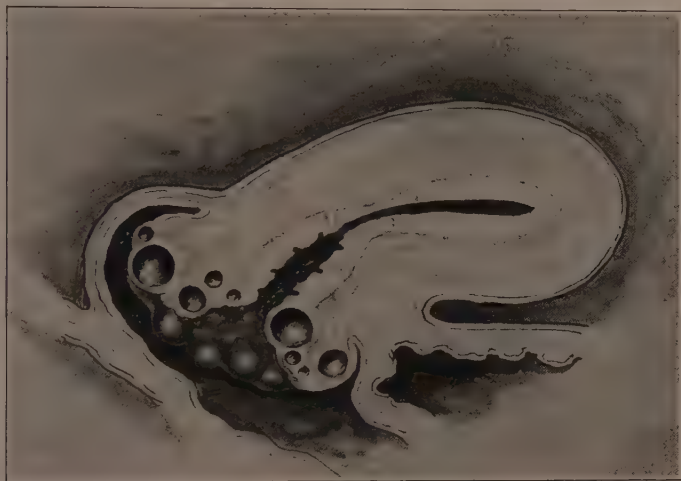
Fig. 77.—Retention (Nabothian) cysts of cervix.

Treatment

Immediate Treatment.—The immediate treatment of lacerated cervix is merely to *maintain asepsis* as much as possible, as in any puerperal case. Indeed, it is unusual to discover the lacerations at this time because there is seldom any indication to look for them.

Even if found, there is no indication to repair them at once, for two reasons: first, most of the lacerations will heal spontaneously without trouble; second, there is more danger of carrying infection by the operation than can be compensated by the good which is likely to be done. Lacerations of the outlet of the genital canal should be repaired immediately, but those of the cervix should be let alone, unless hemorrhage is marked. If so, the tear should be sutured.

Late Treatment.—When lacerations are found, months after the puerperium, which have involved little or no hypertrophy of the portio or which are no longer infected, it is seldom necessary to operate. Whatever general symptoms may be present are probably not due to the lacerations *per se,* but to some other coincident condition.

We no longer hold to *Emmett's views about lacerations.* He held that numerous and sundry general symptoms of a more or less neurotic character, from headaches to rheumatism, were caused by the irritation of the scars of old lacerations of the cervix. There was supposed to be a reflex from the nerves imprisoned in the cicatrices which was reflected in other nerves of the body.

Indications.—When the lacerations have not been completely healed, when the portio is the seat of chronic infection, when the endometrium is exposed to traumatism, when erosions are present, or when there is considerable discharge from the cervical or uterine canal, then some treatment is indicated.

Nonoperative measures, such as the use of hot douches, glycerinated tampons, local applications, posture, and proper dress will often relieve or cure the condition. General hygienic measures, such as, simple diet, laxatives, enemas, fresh air, graduated exercise, and rest will be valuable adjuvants.

When these milder means fail, when the patient does not wish to spend the necessary time, when the hypertrophy and infection are considerable, or when there is the least suspicion of carcinoma, then operation is indicated. The two operative procedures of value are trachelorrhaphy and cervical amputation.

Trachelorrhaphy means *denudation* of the margins of the gaps and suture of the freshened edges so as to restore the portio to its original condition. A retractor is placed in the vagina to hold down the posterior wall and perineum. A bullet forceps or small vulsella is attached to the anterior lip of the cervix and pulls it down toward the vulva. With scissors a generous slice is removed from the laceration, making a raw surface from the endometrium to the outer surface of the portio. The posterior lip is drawn down with another vulsella, and a similar slice is removed from the posterior surface of the laceration. The same is done on both sides of the bilateral laceration. The denudation of the margins of the gaps must extend to the apex of each and no part must be left undenuded.

Beginning at the apex of the gap, *sutures* are passed through

portio surface and cervical tissue to the margin of the mucous membrane of the endocervix, across to the mucous margin of the other side of the gap, through cervical tissue and out through portio surface. Two, three, or four sutures are usually enough to close each gap. Catgut which will last ten days is the best suture material. It is best to pass all sutures on both sides of a bilateral laceration before beginning to tie. One must be sure that he does not unduly narrow the cervical canal. It is well to pass a probe to insure the patency of the cervix before considering the operation finished.

Amputation of the cervix is the operation of choice when there is much hypertrophy of the anterior and posterior lips of the lacerated cervix. A bullet forceps or small vulsella is fastened to each lip of the lacerated cervix to draw them down and to fix them. With scissors the deeper laceration is cut a little deeper at its apex and that on the other side is then cut to correspond with the deeper one.

The anterior lip is held steady by its attached vulsella. With a sharp knife an incision is made in the upper surface across and uniting the angles made on each side by the scissors. This cut curves slightly downwards and passes half through the thickness of the cervix at an angle with the surface of the portio. The knife then makes an incision on the under surface of the anterior lip from the angle on either side and corresponding to the incision upon the upper surface. This incision crosses the endometrium in the middle line. It also is made at an angle with the surface, so that the two incisions with the knife cut out a blunt wedge of tissue from the anterior lip. The extent of the piece removed depends upon the extent of the hypertrophy.

Since there may be some annoying hemorrhage from the surfaces of the wound just made, it is well now to pass sutures through the middle portion of the wound, uniting the endometrium and the portio surfaces. Steadying the cervix by the vulsella which is left attached to the posterior lip, one passes a suture from the portio surface, through cervical tissue, to come out just within the edge of the endometrium in the middle line. This is tied, and most of the hemorrhage is usually stopped.

Then a suture is similarly passed to the right and to the left of the first one, being closer together at the edge of the endometrium than at the edge of the portio. These three sutures will stop all
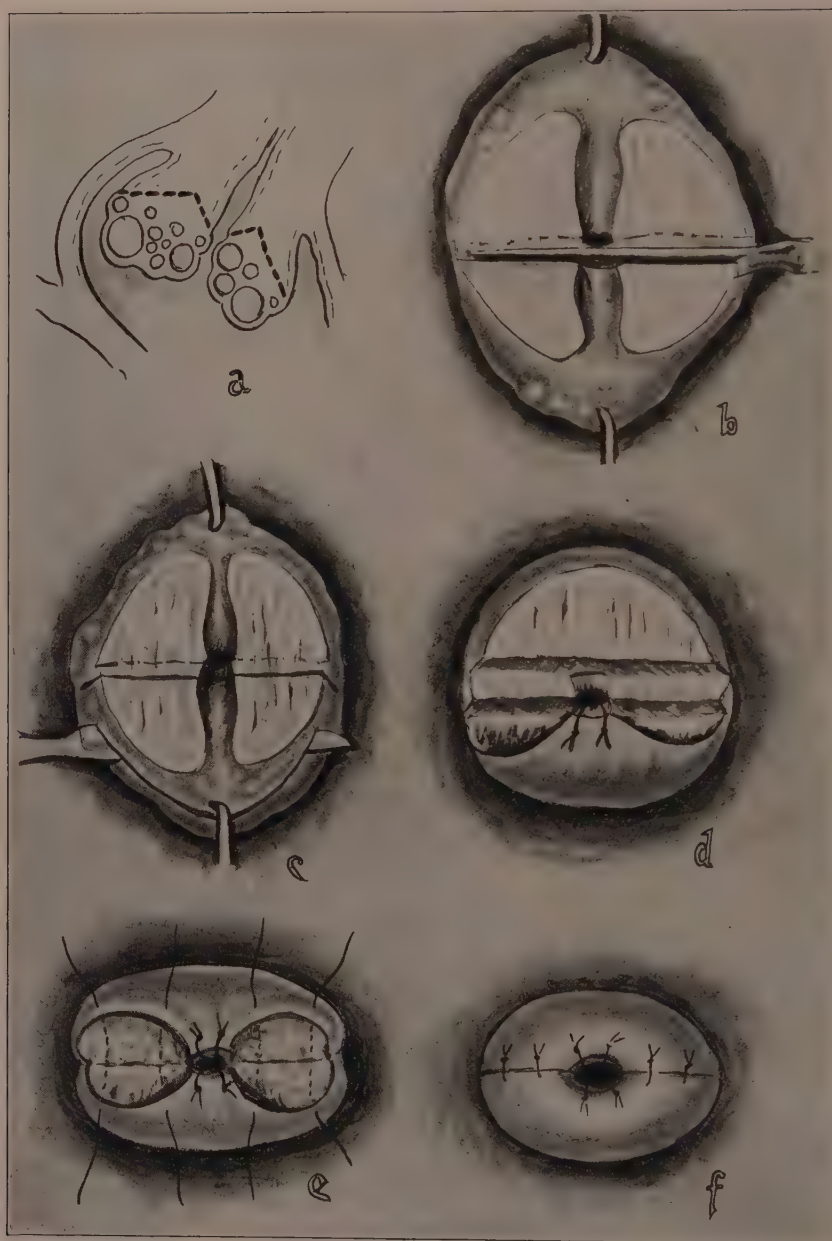
Fig. 78.—Amputation of cervix, showing steps of operation.

hemorrhage and, being left long, will serve as guy ropes later in handling the stump.

Holding the posterior lip with its attached vulsella, similar incisions and sutures are used as already described for the anterior lip. Any ragged portions of tissue left in the angles is trimmed away with scissors.

The operator now has the stump of the cervix held by the six sutures through the middle portions of the anterior and posterior lips. Then enough sutures are passed through the outer portions of the stump from before backwards to close the wound in the cervical tissues. If catgut was used, the sutures should now be cut and left to absorb. If silkworm gut is the material, the ends should be left long to facilitate removal afterwards.

RELATION TO CARCINOMA

While as yet we are ignorant of the true cause of carcinoma, nevertheless, it seems evident that it occurs more often in parts of the body that have been subjected to chronic infection or to frequent irritation. Carcinoma occurs more often in lacerated than in nulliparous cervices. This may be because carcinoma occurs more often between the ages of thirty-five and forty-five, and because most women at those ages are multiparæ. However, the histories of a great majority of the cases of epithelioma of the portio contain the item of a laceration and hypertrophy of the cervix. Therefore the fear of a cancer in later years is a legitimate factor in the indication for operation.

Examination of Removed Portions.—The pieces of cervical tissue, removed at the operations for repair or for amputation of a lacerated cervix, should always be microscopically examined by a competent person. Sometimes carcinoma is already present. If so, the proper operation for cancer should be performed.

Rupture of the Uterus During Pregnancy

Etiology.—We may distinguish *three groups of causes.*

FIRST.—There may be a *congenital predisposition* to rupture on account of circumscribed thinness or hypoplasia of the uterine musculature. The most frequent seat of the rupture is in the upper portion of the corpus uteri. As the pregnant uterus distends, the pres-

sure may become too great for the weakened portion, and the organ may burst, much as does the tube when distended by ectopic gestation. As in the pregnant tubes so in the uterus, the seat of rupture is likely to be at the placental site, because here there is a local thinness caused by the erosive action of the trophoblastic elements of the chorion.

SECOND.—The predisposition to rupture may be the result of *previous scar formation* as a consequence of Cesarean section, perforation by instruments, manipulations during criminal abortion, or the operation of myomectomy.

THIRD.—The tendency to rupture may result from *injuries* due to operations near the uterus, from perforation by the sound or curette in the induction of abortion, or from accidental causes, such as falls against sharp corners, gun-shot wounds, knife or stab wounds, cattle horns, etc.

Rupture from any cause is more likely to take place in uterus unicornis, uterus bicornis, uterus infantilis, and similar malformations.

Diagnosis.—The symptoms of rupture of the uterus during pregnancy are those of shock, with sudden pain in the pubic region, quickened and weakened pulse, syncope, etc. Signs of progressive internal hemorrhage occur. The clotted blood may be felt in the cul-de-sac, upon vaginal examination. The uterus may suddenly lose much of its former size on account of escape of the ovum into the abdominal cavity.

Treatment.—Laparotomy with removal of the uterus will usually be necessary. In some instances, after dilatation of the cervical canal and complete removal of the uterine contents by the curette, the wound in the uterus may be sutured.

Rupture of the Uterus During Labor

Etiology.—The cause is almost always an obstruction to labor with excessive contraction and retraction of the upper uterine segment and excessive thinning and dilatation of the lower segment. It may be *complete,* through the peritoneal coat, or *incomplete,* through the muscular coat only. In the latter case the rupture may be into the parametrial connective tissue.

Diagnosis.—Intense shock and rapid appearance of signs of hemorrhage are the immediate consequences. The labor pains usu-

ally cease at once. In the usual complete rupture the fetus passes into the abdominal cavity. Hemorrhage occurs, not only into the peritoneal cavity, but also through the cervical canal into the vagina and outer world.

Treatment.—Immediate laparotomy, removal of the child and placenta, and closure of the rent in the uterus are the only proper therapeutic measures. If the rent can not be repaired the uterus must be amputated just above the cervix (Porro).

Inversion of the Uterus

This rare accident has direful consequences, both immediate and remote. It may occur with full term labor, and also with premature labor or abortion.

Etiology.—The mechanism consists in the attached or adherent placental site following out after the expelled placenta or attached portion of ovum. The first action of the contracting uterine muscle is to force the placenta or ovum towards the os. As expulsion continues, the adherent portion of the uterine wall follows and passes out through the os after that to which it was attached.

The rest of the wall follows as the uterus turns inside out to permit it, just as a glove finger would be inverted if attached to the withdrawing digit. After the inversion, the external os contracts around the pedicle of the inverted uterus. The inversion may sometimes be started by pulling on the cord when the placenta is retained or adherent.

Results.—The immediate danger is from hemorrhage because the uterine muscle can not contract so as to compress the open sinuses. Another danger is from sepsis. The fundus of the inverted uterus is down to the level of the vulva or even has passed fully out of the canal into the outer world. Of course the endometrium with the placental site is exposed to infection. The contracting os compresses the pedicle and hinders the return flow of blood from the uterus.

Unless replaced, inversion of the puerperal uterus is usually fatal from hemorrhage, from the great shock incident to such a grave accident, or from sepsis. A few cases have been recorded of complete inversion of uterus, cervix, and vagina, so that all of these lie in view, inside out.

CHRONIC INVERSION

Those cases which remain inverted without causing speedy death are usually inversions of the uterus due to abortion or premature labor of early date. In such cases, the fundus may not be forced out of the vulva, but may remain within the vagina. The constriction of the os about the pedicle may partially shut off arterial circulation and thus prevent fatal hemorrhage. Such cases may be undiscovered until long afterwards; truly chronic inversion.

Fig. 79.—Beginning inversion of uterus.

Fig. 80.—Uterine polyp.

Fig. 81.—Complete inversion of uterus.

Fig. 82.—Cervical polyp.

Diagnosis.—The diagnosis of chronic inversion will be made from the history of the case, from the symptoms, and from the examination. The history may show that a premature delivery has taken place. The symptoms will usually be pain in the back and lower pelvis, with feeling of dragging down in the vagina. The bladder will be irritable because of disturbance in its relations to the cervix and uterus.

There will be a copious discharge of mucus, pus, and blood, often with foul odor. Vaginal examination will reveal the presence in the vagina of a pedunculated tumor, and absence of the fundus within the pelvis. The last point distinguishes inversion from uterine polyp projecting through the cervix.

Treatment.—Acute puerperal inversion requires immediate replacement. The patient should be placed with the hips highly elevated, the margins of the os should be grasped by vulsellas, and the uterus should be passed back into the pelvis through the ring made by the os in the manner of applying taxis to reduction of a hernia. If possible the part of the uterus last inverted should be reduced first and the fundus should be the last portion to pass through the ring. Often this can not be accomplished. It may be necessary to incise the cervical ring which constricts the pedicle and then to pass the fundus first through the os by the hand or a wad of gauze held in a forceps.

The *chronic form of inversion* usually requires hysterectomy. The cervical ring is generally firmly contracted and the inverted body of the uterus is so edematous and deformed that it can not be reinverted. Sometimes, by splitting the anterior part of the cervix, and separating the bladder from its attachments thereto, reinversion can be accomplished.

It is well to begin the operation in this way, because, if reinversion is impossible, the whole uterus can be split in the median line and removed half at a time. As the splitting proceeds it can be seen what tissues are within the peritoneal funnel formed by the inverted uterus. Thus one can avoid wounding intestine or other abdominal viscus.

INJURIES RESULTING FROM COITUS

The **hymen** is usually lacerated during the first coitus. Sometimes the hemorrhage from the rent is troublesome, but very seldom requires treatment.

The **medico-legal value** of the condition of the hymen as determining whether sexual intercourse has ever been performed is far less than is commonly supposed. Individual hymens differ much in size of opening, in elasticity, and in distensibility. The passage of the male organ does not necessarily rupture the membrane. The

hymen may be stretched to allow passage, or, if very elastic, may be pushed far into the vagina. Indeed, numerous cases are recorded where conception occurred without visible injury to the hymen.

On the other hand the hymen may be congenitally absent or rudimentary. It may have been torn by accident, by passage of a specu-
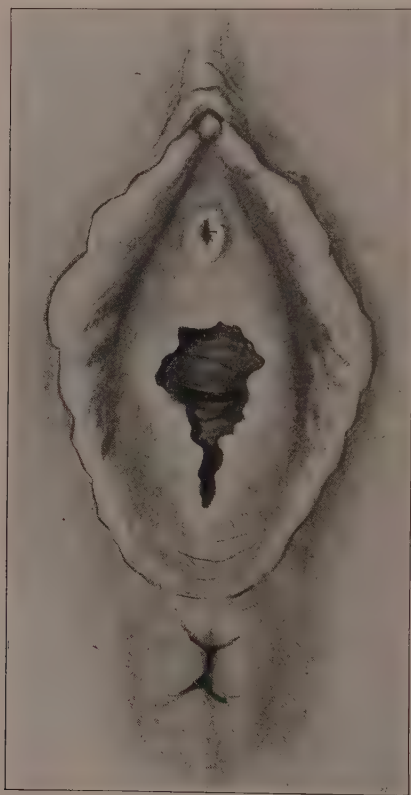
Fig. 83.—Laceration of hymen, postcoitum.

lum or by digital examination. Therefore absence of the hymen is no real proof of coitus, nor is its presence real proof of virginity.

Etiology.—Injuries of other parts of the genitals during coitus are not necessarily due to disproportionate size of the male organ. The normal female passages will ordinarily accommodate themselves even to one of very great size. Violence in coitus on the part of either or both parties is a potent cause of injury to vulva or vagina.

Excessive libido in the female is recorded in a large number of the cases. It appears that the vagina, under these circumstances, contracts so strongly that it is temporarily made shorter and smaller. Abnormal postures during the act are rather prone to favor traumatism. Abscesses in the parametrium, in the tubes, or elsewhere in the pelvis may be ruptured. An ectopic gestation sac, a sactosalpinx, or an ovarian cyst may be burst by the sexual act, with disastrous results.

Situation of Injuries.—Lacerations from coitus are most frequent in the posterior wall of the vagina, or in the vault. The perineum is sometimes torn. Occasionally the labia minora or the vestibule may be wounded. If the latter is deeply torn, alarming hemorrhage is likely. The urethra may be injured. In some cases of tough hymen or of absence of vagina, the male organ may be forced into the dilated urethra.

Treatment.—The main indications for treatment in these injuries to the genital canal are to stop hemorrhage, and to prevent infection. The first is met by tampon, by pressure, by ligature, or by suture. The second by suture and by aseptic care.

INJURIES RESULTING FROM THE USE OF INSTRUMENTS

The **obstetrical forceps** is a frequent source of injury to the parturient canal, either unavoidably, or because of unskillful use. It often causes lacerations of the perineum, the posterior vaginal wall, the rectovaginal septum, the anterior vaginal wall, the bladder and urethra, the cervix and uterus, and almost any part of the vulva.

The **uterine sound** and the **curette** are common offenders in producing perforations of the uterus and sometimes of the vaginal vault. While using the instrument, especially the curette, it is felt to pass farther into the body than formerly and continues to pass without encountering opposition. When a perforation of this character is suspected, the instrument should be withdrawn and the patient should be put to bed at once.

When such an accident happens it is the general practice of good operators (for such accidents will occasionally fall to the lot of even good operators) to await developments. While the instrument is probably not sterile when it begins to perforate, yet it is usually wiped clean as it passes through the tissues. Furthermore, the muscle con-

tracts and closes the perforation so as to prevent further leakage from the cavity of the uterus into the peritoneum. Exudate immediately forms at the peritoneal side of the wound and generally prevents further infection of the abdomen. It must be remembered that the peritoneum is tolerant of a certain amount of infection, provided there is no continuation thereof.

If the rent in the uterus is large, or if symptoms supervene, it is indicated to open the abdomen and repair the damage.
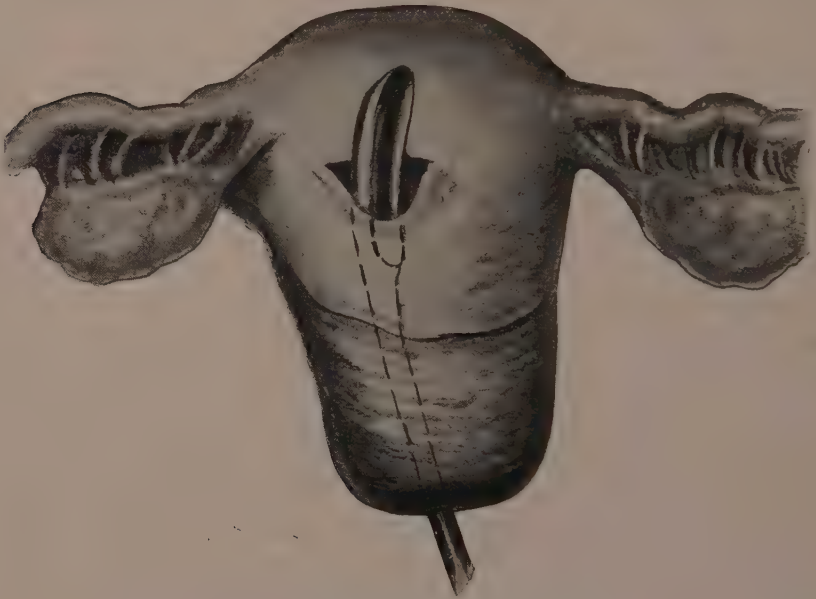
Fig. 84.—Perforation of uterus with curette.

Pessaries often cause ulceration of the vaginal and cervical tissues; sometimes deep wounds, even extending into the bladder, peritoneum, or rectum. A well fitting pessary, properly placed and of the shape adapted for the particular displacement existing, will seldom cause trouble even after prolonged stay. When it is too large, is improperly placed, or is used incorrectly for the particular displacement, it presses unduly upon parts of the vagina or cervix, and causes necrosis. The maceration of the vaginal epithelium caused by the discharges also renders the canal more susceptible to injury from the

pressure. Occasionally a neglected pessary will work its way deeply into the tissues and become partially or wholly embedded.

The **treatment** for such conditions varies with each particular condition. It always involves removal of the pessary, by operation if need be, and antiseptic treatment of the vaginal canal. The resulting fistula, if any, into rectum or bladder will require special treatment.

Misplaced sutures and ligatures, employed during operations, may cause various injuries to the genitals. Perineal sutures may enter the rectum and cause fistula. Sutures in anterior colporrhaphy may have similar effect in the bladder or urethra. Ligatures or forceps applied to the parametrium and broad ligament in vaginal operations on the uterus may injure the ureter. One may sew up too tightly the cervical canal or the os in performing trachelorrhaphy or amputation.

The use of **caustics,** formerly much in vogue, may cause considerable ulceration of tissue and may close the vaginal, cervical or uterine canal. The cicatrization resulting from ulceration following caustics may cause various deformities by secondary contraction. It may cause irritable bladder symptoms when it disturbs the junction of vagina and bladder or of uterus and bladder.

Sometimes, in using **carbolic acid douches,** enough care is not observed in mixing the solution. Some of the 95 per cent phenol remains in the bottom of the douche bag and enters the vagina first. Superficial necrosis of the vaginal mucous membrane or even some ulceration deeper into the tissues may result. If the patient does not stop the douche as soon as she feels the smarting of the concentrated carbolic acid, but allows the rest of the weak solution to wash it out, she will fare better. The treatment of the ulceration which may result is along aseptic lines, such as sterile douches followed by light gauze tamponade.

INJURIES RESULTING FROM FOREIGN BODIES

Etiology.—Winckel has classified foreign bodies in the female genitals according to the purpose or mode of entrance.

Masturbation is a frequent reason for introducing foreign bodies into the genital canal. The objects used are legion. Hairpins, hatpins, shawl pins, pencils, radishes, carrots, bananas, glass bottles, and even insects have frequently been introduced for the purpose of exciting sexual feelings and perhaps bringing on the orgasm. Sometimes, by

intention or by mistake, the object is introduced into the urethra and finds its way into the bladder.

In attempts to prevent conception foreign bodies are often introduced, which become forgotten or lodge within the vagina, cervix, or uterus. Tampons, sponges, stem pessaries, and the like may be left in and be forgotten. The stem pessaries are especially likely to cause trouble. Advertised for cure of sterility, but intended, as everybody knows, to prevent conception by closing the cervical canal, they are far from reliable for their ostensible object, but are dangerous because of liability to cause pressure necrosis and sometimes perforation of cervix or lower uterus. They may become embedded and require an ingenious operation for removal.

Employed as a *means of producing abortion*, foreign bodies of many kinds are often imprisoned in the genitals. The most common object used for this purpose is a tent of some kind, especially a sponge or slippery elm tent. The whole tent may pass beyond reach of the person introducing it, or a piece may break off and remain. Slippery elm bark is a favorite with many women for self-introduction.

Articles or pieces of *articles used for therapeutic* purposes may be left within the female passages and be forgotten. Pieces of glass specula or of glass douche points, left within the vagina, may wander through its walls into neighboring regions. A piece of gauze used as a uterine tampon may remain after the rest of the strip has been removed. Tampons may remain for months or years, forgotten by the woman.

Pessaries, as already noted, are foreign bodies which are very likely to cause trouble when suffered to remain too long within the genital tract.

A fifth class of foreign bodies includes those which *wander into the genitals* from neighboring organs, or which may enter unknown to the patient from without. Such are intestinal worms, hair and teeth from an ulcerating dermoid cyst or bones from a fetus in an ectopic gestation sac.

Symptoms.—The symptoms of a foreign body within the genital canal are copious purulent and muco-purulent discharge, sometimes bloody and fetid discharge, pain on urination, pain on defecation, pain on coitus. Vaginal examination, manually or by means of the speculum, reveals an indurated mass and sometimes the foreign body partly encased in the mass.

Treatment.—The treatment is removal of the foreign body and antiseptic after-treatment. The indurated mass must sometimes be incised in order to free the foreign body. Sometimes cicatricial bands or stenoses must be cut. Sometimes the foreign body must be cut into smaller pieces with powerful scissors or broken with strong forceps.
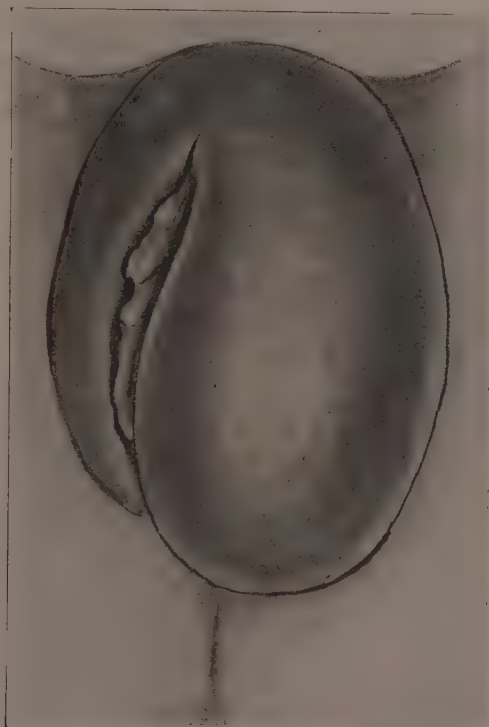
Fig. 85.—Hematoma of vulva. (From preparation in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

INJURIES RESULTING FROM ACCIDENT

Etiology.—Accidental wounds of all sorts may be inflicted upon the genitals of a woman. The most common are those resulting from impalement; from bruises due to falls and blows; from cuts by sharp instruments; from gun-shot wounds; from burns.

Falls upon sharp sticks, pitchfork handles or tines, astride of pickets, or against edges of boards and furniture may produce wounds of all

degrees of severity and danger. Usually the injury is confined mainly to the labia and to the vulva, but, in rare instances, the vagina has been ruptured into the bladder, rectum, or peritoneum.

The internal genitals are usually well protected from external violence but occasionally the uterus, pregnant or not, has been ruptured by falling against a sharp corner or by the fall of a heavy body upon the abdomen just above the pelvis. A cyst or an ectopic gestation sac may be ruptured by bimanual examination or by massage.

The **symptoms** are those of shock and internal hemorrhage. Sometimes the bleeding will also be visible externally.

Treatment must be indicated by the peculiar circumstances of the individual case. It should be according to general surgical principles.

GENITAL FISTULÆ

Any injury which affects at the same time the walls of the genital tract and those of some contiguous cavity may effect an abnormal communication between the two tracts. Such injuries may result from the passage of the fetus during labor, from obstetrical instruments or manipulations, from gynecological or other surgical operations, from destructive ulceration, and from various accidental wounds.

The **genital fistulæ are classified** according to the places which are brought into abnormal communication by them. Vesicovaginal fistula, by far the most common, is one allowing communication between the bladder and vagina. Vaginourethral fistula is one between the vagina and urethra. Vesicouterine, ureterovaginal, and others are defined by the names.

Vesicovaginal Fistula

ETIOLOGY

The cause of vesicovaginal fistula is usually pressure of the child's head against the pubes, with the walls of the bladder and vagina intervening. Therefore contracted pelvis, excessively large head, and similar causes of dystocia are important factors. Long continued pressure is more likely to beget the fistula than hard pressure exerted for a comparatively short time. Impaction of the head, that is, arrest of the head so that it does not advance with the pains or recede with the

intervals, is the commonest reason for the production of a fistula. Therefore delay in applying the forceps is often responsible.

Sometimes prolonged pressure with the forceps or a sort of cutting of the vaginal wall by the tip of the blade will cause the trouble. Occasionally spicules of bone or sharp edges after craniotomy will be the cause. Occasionally a fistula is produced deliberately in order to drain the bladder, or to remove a stone or foreign body. Next to pressure by the head, probably ulcerating carcinoma of the cervix is the most frequent cause of vesicovaginal fistula.
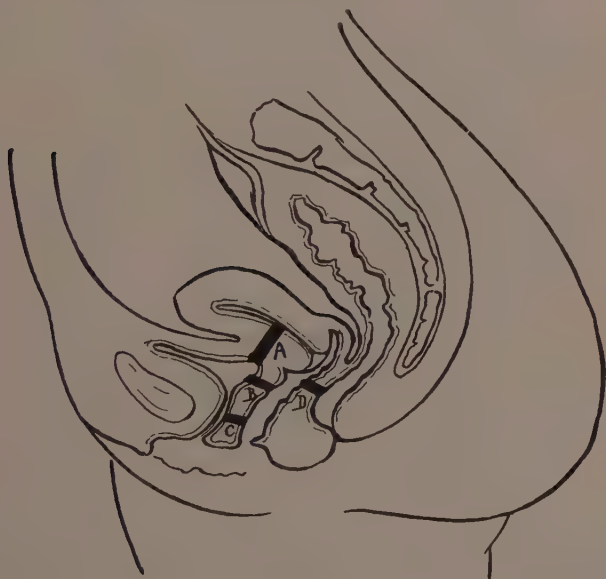
Fig. 86.—Diagram showing more important types of genital fistulæ.

Diagnosis

In most instances, the symptoms of a vesicovaginal fistula are not manifested immediately after the occurrence of the injurious pressure, but several days later. The necrotic portion of the septum begins to leak only after it begins to slough away. Sometime during the first or second week, the patient will complain of involuntary urination. Examination will show that the urine comes from the vagina. In most cases it will drain away continuously and none will come through the urethra.

The location of the fistula can be detected by a probe passed through

the urethra into the bladder and out through the hole in the vagina. If the opening is small or in an inaccessible situation, injection of some nonirritating colored fluid into the bladder will show the place of the fistula as it leaks into the vagina. Usually there is passage of bloody urine from the urethra before the leakage occurs from the vaginal fistula. If the fistula is large, the farther bladder wall is seen pouching through the opening as a dark red velvety mass.

RESULTS

The bladder is liable to infection through the fistulous opening and *cystitis* is the rule in chronic cases. The dribbling urine causes *skin irritation* about the vulva and inner aspect of the thighs. Urinary salts are incrusted upon the pubic and labial hairs, and a urinous odor is persistent and disagreeable. Calcareous and other saline deposits form in the vagina. Menstruation is often disturbed; coitus is impaired. Fertility is much diminished because of the action of urine upon the spermatozoa. If pregnancy occurs, it is often prematurely interrupted. The chances of infection during labor and puerperium are increased.

PROGNOSIS

The prognosis depends upon the success of the operative treatment, because such fistulæ seldom heal spontaneously.

TREATMENT

It is seldom advisable to attempt to repair the fistula until six or eight weeks after labor. Until then the parts are too vascular and too easily torn by the stitches.

The **preparatory treatment** should consist in rendering the bladder and vagina as clean as possible by sterile douches and irrigations and by the use of hexamethylene preparations.

Operative.—The main principle in repairing genital fistulæ is complete mobilization of the margins by free dissection between the layers of the septum. Almost equally important is avoidance of pressure and pull from scar tissue, and prevention of tension in the sutures. The operative treatment in vesicovaginal fistula consists in refreshing the edges, separating the bladder from the vaginal wall by splitting the septum, and uniting by sutures the margins of the opening. The preferable method is as follows:

With scissors or fine bistoury, remove a little tissue all around from the margin of the fistula. The vaginal wall should be slit up for a short distance at each end in the long axis of the fistula. This will facilitate separation of the vaginal and the vesical walls.

This separation by dissection should extend far enough from the margin in all directions so that, by means of forceps or tenacula, one can bring the vaginal wound together throughout its whole extent.
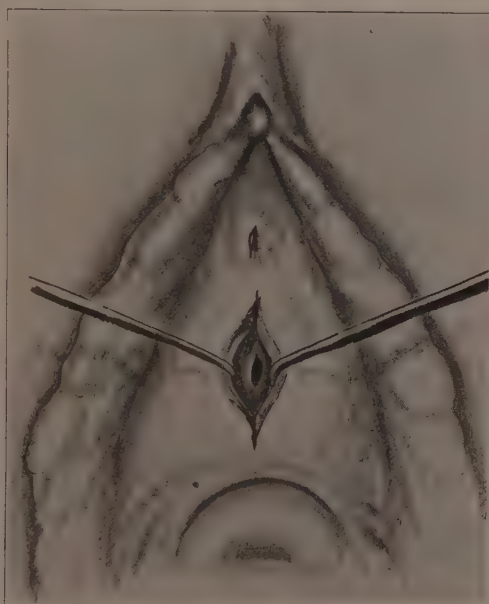
Fig. 87.—Operation for vesicovaginal fistula. Incision of vagina and separation of vaginal and bladder walls preparatory to separate suturing.

Then fine catgut sutures are passed through the margin of the bladder wound, taking up sufficient of the bladder wall, and coming out just at the edge of the vesical mucous membrane. If possible, there should be no stitches through the mucosa, that is, within the bladder.

Next the vaginal stitches are passed. These may be of long lasting catgut or of silkworm gut. Each suture should enter the margin of the vaginal wound, should take up the tissues in the depth of the wound so as to avoid loose spaces, and should pass out at the opposite side of the margin of the vaginal wound. By this means, both vagina and bladder are closed by separate sutures, and there is less danger of

leakage or of infection than when only one set of sutures unites both bladder and vaginal walls.

When the site of the fistula is high, towards the cervix, or when the opening is large, it is often advisable to make an extensive dissection of the vaginal wall from the bladder, even separating to some extent the cervix from the bladder. By this means, the bladder wall can be pulled down to cover a considerable defect. Furthermore, when the final suture is completed, the original sites of the openings in the
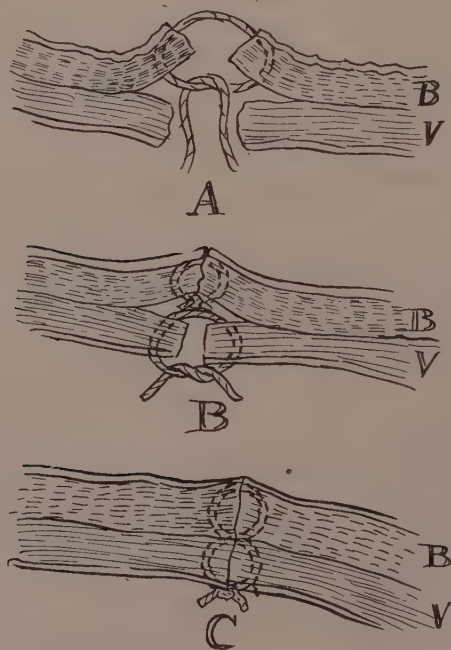
Fig. 88.—Diagram showing method of suturing bladder wall, *B;* and vaginal wall, *V.*

bladder and in the vagina are more or less widely separated from each other and the chance of leakage is diminished.

Postoperative.—The after-treatment of vesicovaginal fistula is often the determining factor of success. Often a self-retaining catheter must be left in the bladder for several days. In any event, the bladder must not be allowed to become distended with more than half a pint of urine, because of danger of stretching the sutured wound and thus causing a recurrence of the leaking.

For the first few days at least the use of a catheter will be neces-

sary, because spasmodic retention is the rule. If the fistula has existed for a long time, the bladder has not been accustomed to any distention with urine and will probably have contracted so much that it will not tolerate a normal amount for a long time afterwards, if ever. Hexamethylene preparations should be given for the first few weeks after operation.

Vaginourethral Fistula

ETIOLOGY

The causes of fistula between the urethra and vagina are similar to those of vesicovaginal fistula. The condition is very rare. The opening between bladder and vagina is the commonest form because the pressure of the head against the pubes is usually at the point where the base of the bladder is caught between the head and bone. Obstetrical operations, especially with the use of forceps, and the operations for widening the pelvis are relatively frequent causes of urethral fistula.

DIAGNOSIS

The symptoms of this form of genital fistula also appear some days after the injurious pressure has been exerted. Usually there is retention of urine during this time, due to irritation of the vesical sphincter. When the fistula becomes established, urine flows into the vagina only at the regular micturition, instead of continuously. Often some urine will escape from the meatus with micturition. The sphincter is usually intact, and prevents the bladder from emptying itself except at the will of the individual. Sometimes it is not easy for her to find out that she has an abnormal opening, but usually the fact that urine passes into the vagina and then comes out through the vulva is apparent. In some instances the bladder will empty into the vagina and the vagina will for a time retain some or all of the urine.

TREATMENT

The operation for repair of this form of fistula varies much in its details, depending upon the extent of the fistula and the extent of the cicatricial formation in the urethra. The whole caliber of the urethral tube is often involved in the pressure necrosis, and sometimes the scar tissue is extensive. Often much of this scar tissue must be removed

and a new mucosa of the urethra must be obtained by plastic work from the vagina. Each case must be a law unto itself.

Vesicouterine, Ureterouterine and Ureterovaginal Fistulæ

Fistulæ between the bladder and uterus, or between the bladder and cervix, must be repaired by opening into the anterior vault of the vagina, separating the bladder from the uterus to some distance above the fistula, and then suturing the vesical opening. The opening into the uterus or cervix will heal of itself.

DIAGNOSIS

The diagnosis of vesicouterine fistula is made by passing a probe through the bladder into the uterine or cervical cavity, or by injecting colored fluid into the bladder and seeing it come out of the os uteri. Thus the distinction is made between a vesicouterine and a *uretero-uterine fistula.* In the latter the urine dribbles continuously from the opening in the ureter, and will not be influenced by fluids in the bladder. The cystoscope will confirm the diagnosis.

Ureterovaginal fistula is manifested by the passing of urine through a small opening into the vagina near the situation of the ureter. The diagnosis is confirmed by the negative result of injecting colored fluid into the bladder, and by the cystoscope. The cystoscopic examination will show no fistula in the bladder, and no urine coming from the affected ureter. Sometimes methylene blue is administered by mouth to give a color to the urine.

TREATMENT

In many cases, the tendency of ureteral fistulæ is to close spontaneously. When they do not close, attempts must be made to close them by some type of plastic operation.

Ureterouterine fistula must usually be repaired by laparotomy and by transplanting the ureter into the fundus of the bladder.

Ureterovaginal fistula can be repaired through the vagina. A small opening into the bladder is made near the fistula, the vaginal mucosa about the fistula is denuded, and the portion of the vaginal wall with the fistula is fastened into the bladder at the apex of the operative opening in the bladder, and the remainder of that opening is sutured.

Ureterovaginal fistula is usually caused by vaginal hysterectomy. In such cases, it is generally easier to close the fistula by transplanting the ureter into the fundus of the bladder.

Inoperable cases of genital fistula involving the urinary tract must be treated by careful attention to cleanliness, and by wearing some sort of a rubber receptacle to hold the urine. Such are made by various instrument manufacturers, and can be fitted by them to the patient.

Rectovaginal Fistula

ETIOLOGY

Communication between the genital tract and the alimentary canal are very rare except between the vagina or vulva and the rectum. They are usually caused by a laceration of the rectovaginal septum during labor, or by unskillful suturing of the perineum. The situation is usually just above the internal sphincter ani. They tend to spontaneous healing more than do vesicovaginal fistulæ.

DIAGNOSIS

The diagnosis of rectovaginal fistula is made from the passage of gases and fecal matter by way of the vagina. Infection of the contents of the vagina naturally follows, and may extend to the uterus or higher. Coincident lacerations of the cervix favor such extension. The menstrual flow is also favorable to upward extension of the infection.

There is usually, in addition to the fistulous opening, a laceration, incomplete or complete, of the perineum or a relaxation of the pelvic floor, all caused by the same traumatic factors.

TREATMENT

Palliative.—If the caliber of the rectovaginal fistula is small, it may heal spontaneously. This spontaneous healing may be favored by efforts at asepsis of vagina and rectum. Frequent antiseptic douches and frequent enemas aid in this purpose. Sometimes a small fistula may be induced to close by injecting iodine or silver nitrate solutions through it by means of a fine probe-pointed syringe. In some instances closure may be effected by the moderate use of lunar caustic at the vaginal opening of the fistula.

Operative.—When the opening is high in the rectovaginal septum, it may sometimes be closed by operating according to the principles detailed in describing the operation for vesicovaginal fistula.

Usually the best procedure is to split the perineum by dissecting a flap of the posterior vaginal wall, beginning at the fourchette and extending upwards beyond the fistulous opening. This divides the fistula into a vaginal and a rectal opening. The edges of the rectal opening are freshened, and the hole is closed by catgut sutures. These sutures should be passed through the muscular and other tissues surrounding the opening. They should just graze the margin of the mucosa without entering the rectum. Afterwards the wound should be closed with buried catgut sutures as in repair of the pelvic floor. The vaginal mucosa and the perineal skin are then closed with sutures of silkworm gut.

Sometimes it is more feasible to incise the perineum and anterior portion of the anus as far as the fistula, and then to proceed as in repair of a complete laceration of the perineum. The rectal mucous membrane can usually be dissected from the vaginal wall rather widely, and can then be brought down to form the anterior part of the margin of the anus. The sphincter ani is united in the median line in front by deep buried catgut sutures, or by silkworm gut sutures passed around from the anal margin and including the muscular fibers of the sphincter. In other words, by this method the fistula is converted into a complete tear of the perineum, and is repaired as one would repair such a tear.

Other Genital Fistulæ

Openings between the intestinal canal and the uterus or the vaginal vault may result from parturition, from rupture of abscesses, from accidents during operations, or from other accident.

The **repair** of such fistulæ usually requires laparotomy and the treatment of the case according to general surgical principles, depending upon the peculiarities of the individual case.

CHAPTER X

GYNECOLOGICAL HERNIA

By the term gynecological hernia is meant the hernial protrusion of portions of the internal female genital organs from the abdomen or pelvis. This protrusion, like hernia in general, is due to weakening of the natural supports of openings or potential openings in the muscular and fascial coverings of the abdomen and pelvis.

The extent of such hernial protrusion depends upon the extent of the weakening of the natural supports of openings or potential opensure is greatest in the lower portion of the abdominopelvic cavity because of the hydrostatic law that pressure is greatest at the lowest portion of any vessel containing fluid. In the erect human body, pressure is greatest at the pelvic openings, a little less at the femoral and inguinal rings.

Hernia of the internal female genitals by way of the vaginal opening is the same as *prolapse of the female genitals.* Prolapse always involves all the contents of the pelvis, although different organs will be more prominent in different cases. Thus we speak of prolapse of the uterus; of the vaginal walls, anterior or posterior; of cystocele and rectocele. All of these different phases of prolapse are truly herniæ, and are due to lack of support of the contents of the pelvis from faulty development or trauma of the pelvic floor.

It is only lately that prolapse has been recognized as hernia, and subject to the general principles which pertain to all herniæ. Heretofore special stress has been laid upon the different degrees of descent of the uterus alone, as if that organ were the only one concerned in prolapse. The best modern authorities now look upon prolapse as a hernia, and prolapse of the uterus as merely an important incident of a hernia of the pelvic organs.

Hernia of the female genital organs may, therefore, be divided into *prolapse,* meaning descent and protrusion of the internal female genital organs through the vaginal opening in the pelvic floor; and *hernia of the internal genitals* through ordinary surgical hernial canals, such as the inguinal canal. The latter form of gynecological

hernia is uncommon and chiefly of academic interest. The former comprises a very important part of gynecology.

PROLAPSE

Etiology

The causes of prolapse may be classified as predisposing and exciting. The predisposing causes may be grouped under insufficiency

Fig. 89.—Prolapse of uterus. (From preparation in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

of the supports of the pelvic organs; the exciting causes, under abdominal pressure. The result of these two factors is that after weakening of their fixation apparatus, the organs of the pelvis can no longer withstand the abdominal pressure.

The **predisposing causes** of prolapse are those which injure or relax the supporting structures of the organs. Chief among these causes is *labor,* especially difficult or frequently repeated labor. A

rare cause is *imperfect innervation* of the musculature of the pelvic floor, resulting in trophic disturbance, impaired nutrition, and therefore imperfect development of the muscles. This faulty innervation may be the result of congenital anomaly of the spinal centers of the muscles involved. It may be the result of defects in the nerves of the cauda equina due to spina bifida of the sacral or lumbar regions. *Trauma* from causes other than labor may sometimes result in defects of the supporting apparatus.

The **exciting cause** of prolapse is such increase in abdominal pressure as to overcome the weakened resistance of the defective supporting structures. If the defects are marked, ordinary abdominal pressure will eventually cause the pelvic organs to descend and protrude through the vaginal opening. If the defects are slight, greater pressure will be required, or it must be exerted over a longer period of time.

Abdominal pressure is increased by coughing, straining, heavy work, long standing, or other exercise. It is also heightened by increase in the contents of the abdomen, such as accumulation of fat, tumors, enlarged liver or other organ, distended bladder or rectum. Sometimes the causes must work for a long time before the prolapse becomes noticeable. Sometimes prolapse appears very soon after acquirement of the predisposing causes. All depends upon the relation between the defective support and the abdominal pressure. Therefore, it will be seen that the etiology of prolapse is, in general, the same as that of hernia elsewhere.

Normal Supports of the Female Pelvic Organs

The normal supports of the internal genitals in women are enumerated by Halban and Tandler as follows:

The **suspensory apparatus** is composed of the peritoneum, the ligaments, the vessels and nerves of the pelvis, the pelvic connective tissue, and the union of the uterus to the neighboring organs.

The **supporting apparatus** proper is given as the structures of the pelvic floor. In other words, the uterus and the other internal genital organs are held suspended by the network of the ligaments like a spider surrounded by several flies in a web. The main suspending ligament is the broad ligament, which holds the uterus as in a sling, and incidentally the ovaries and tubes also. The sacrouterine,

the uterovesical, the vesical, and the round ligaments hold the uterus rather lightly, and very much like guy-ropes.

Most authors lay much stress upon the function of the ligaments
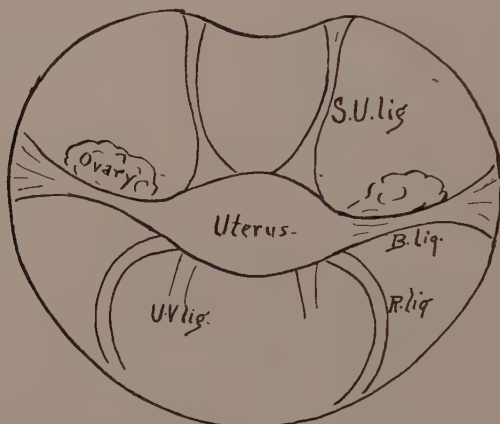
Fig. 90.—Diagram showing arrangement of uterine ligaments.

Fig. 91.—Diagram showing hammock action of pubococcygeus muscles. Arrow indicates direction of pelvic pressure.

as supports of the uterus, but the modern tendency is to follow Halban, who holds that the most important factor is the architectural and mechanical construction of the pelvic floor. It is possible for the organs to be held by the suspending ligaments for a time in nearly

their normal positions and levels, even after the support of the pelvic floor has been weakened. Sooner or later, however, abdominal pressure will force them all downwards and outwards in spite of the resistance offered by the suspensory apparatus alone.

The **pelvic outlet** is mainly closed by the muscular and fascial structures of the pelvic floor, chiefly the levator portion of the pubococcygeus. Just as in inguinal hernia, the mesentery of the intestine offers little or no resistance to the prolapse of the hernial contents, so the ligamentary supports of the uterus offer little resistance to prolapse of the pelvic contents through the weakened pelvic opening.

Therefore, one sees the folly of attempting to cure prolapse of the
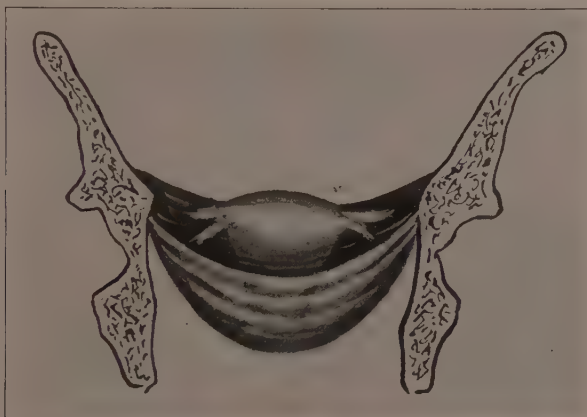
Fig. 92.—Diagram showing hammock action of pubococcygeus. One may compare the condition to that of a hammock supporting an occupant.

genitals by operations which only shorten the suspensory structures without at the same time closing the gap in the supporting structures of the pelvic floor. It is as if one should hope to cure inguinal hernia by shortening the mesentery and not closing the inguinal canal.

The **levator ani** hangs like a hammock, surrounding .and supporting the rectum, vagina, and whole pelvic outlet. When a laceration extends deep enough inwards and to one or both sides of the posterior vaginal wall to separate some of the fibers of this hammock-like sling, the support of the sling is weakened in the same degree. One may compare the condition to that of a hammock supporting an occupant. Some of the strings are cut anteriorly and the sling is thereby impaired. If enough strings are cut the support is weak-

ened enough to throw the occupant out. Repair of the strings will restore the function of the hammock.

In an analogous manner some of the anterior fibers of the levator ani sling are severed by a laceration, and to the same degree the support of the opening of the pelvis is weakened, and pelvic floor rendered inadequate against the abdominal pressure. Therefore, the contents of the pelvis start outwards through the pelvic openings, and prolapse of the pelvic contents results. Repair of the pelvic floor restores the supporting function of the muscular and fascial structures, and prevents or cures the prolapse.

Pathology

Given a weakening of the pelvic floor and sufficient abdominal pressure, the pelvic contents will protrude. Different portions of the pelvic contents may protrude in different degrees. Usually there is more or less protrusion of the vaginal walls with the accompanying portions of bladder or rectum attached thereto.

Prolapse of the anterior vaginal wall with accompanying portion of the bladder is known as *cystocele*. Prolapse of the posterior vaginal wall with accompanying portion of the rectum is known as *rectocele*. Sometimes one is more prominent; sometimes both are much in evidence. Eventually the out-folding of the vaginal walls pulls down the cervix and uterus, and uterine prolapse is said to have occurred.

In some instances the ligamentary supports of the uterus are sufficiently strong to delay its descent, and the pull of the prolapsing vagina drags upon the cervix so as to elongate it. This is aided by the tendency to edema and hypertrophy of the cervix due to faulty venous return circulation.

When the ligamentary supports of the uterus are not especially strong, and when the vaginal walls are rather dense, the uterus may start down the canal with little eversion of the vaginal walls. This condition is sometimes known as simple prolapse of the uterus. All these varieties of prolapse of pelvic contents must be understood as merely different degrees of prolapse of the various structures and not at all as different processes.

Retroversion.—In the normal state, the axis of the uterus lies almost at an acute angle with the axis of the vagina. With the bladder empty, the axis of the uterus is nearly horizontal as the woman

stands erect. The essential supporting portion of the broad liga-
ment, namely, that portion running from the infundibulo pelvic to
the ovarian ligament and including both of them, with its fellow of
the opposite side, holds the uterus nearly horizontally suspended so
that it can swing between the attachments of these ligaments.

As the uterus is forced downwards in prolapse through the pelvic
canal and vaginal canal its lower segment must tip downwards and for-
wards and its fundus tip downwards and backwards. In other words,

Fig. 93.—Prolapse of uterus.

in order to pass down the vaginal canal towards the outlet, the uterus
must turn the corner to follow that canal. Therefore it becomes
retroverted. It is exceptional for the uterus to prolapse without also
becoming retroverted.

As the pelvic organs descend and become crowded into the lower
pelvis, the vascular supply is disturbed. Return circulation through
the veins of the parametrium and broad ligaments is impaired, and
passive congestion results. With this comes edema and hypertrophy.
Congestion of the endometrium gives rise to so-called catarrhal in-
flammation. Impaired circulation renders the endometrium less im-

mune to infection. Infection is thus easily transmitted through the
relaxed vaginal outlet and the probably lacerated cervix to the
endometrium of the prolapsed uterus.

The cervix is usually found hypertrophied, the uterine body en-
larged and tender. The ovaries are often cystic, and the tubes are
often adherent to ovaries, uterus, and other organs of the pelvis.

Symptoms

Passive congestion due to impaired venous circulation often causes
increased menstrual flow, and sometimes flow of blood during the
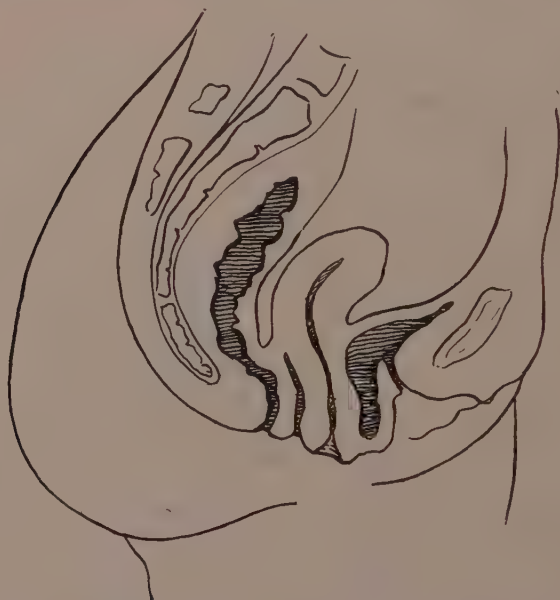
Fig. 94.—Prolapse of uterus and bladder with elongation of cervix.

menstrual intervals. Mucus is abundantly secreted by the endo-
metrium and endocervix, therefore, a mucoid discharge is a common
symptom.

Feeling of weight and bearing down, also pains in the lumbar and
sacral regions are frequent. When the prolapse is extensive, the
woman may notice the protrusion of the vaginal walls or of the uterus.
In complete prolapse, known as *procidentia,* the uterus, covered by
the inverted vaginal walls, and by the prolapsed bladder and rectum,

may lie in the outside world. Pressure from clothing may cause ulcerations on the exposed parts.

Sterility is common, depending upon the degree of the prolapse. There is a great tendency to premature discharge of the ovum if pregnancy should occur.
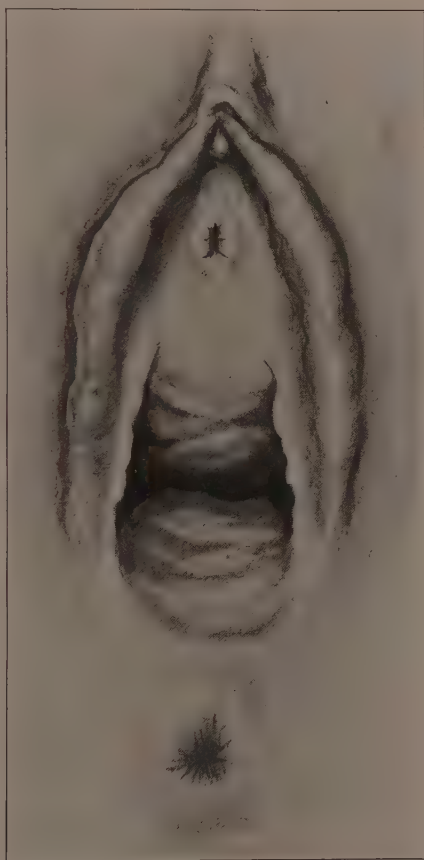
Fig. 95.—Outlet in deep laceration of cervix.

Diagnosis

Diagnosis is made from a consideration of the foregoing symptoms, the history of previous labor, and the physical examination. In marked and advanced cases, the protruding parts may be seen at the

vulvar orifice. In less marked cases, separation of the lips of the vulva may reveal the cystocele or the rectocele.

Bimanual examination will reveal a retroverted uterus, usually in a position lower than normal. The uterus will usually be found enlarged, often boggy, and tender. Leucorrhea of a mucous or muco-purulent character will often be noted. Especially to be noticed is the relaxation of the posterior vaginal wall. Passing both index fingers into the vagina and pulling downwards and outwards on both sides, one will note the laxity of the muscular and fascial structures of the pelvic floor.

Prognosis

As regards life, the prognosis is seldom grave. Discomfort, pain and distress in the pelvis, tendency to abortions, and often inability to follow the duties of life satisfactorily are the chief points to be considered. A chronic invalidism with attendant neurasthenic manifestations and disturbances of digestion, defecation, and micturition are usually sufficient to call for treatment.

Treatment

Prophylaxis.—Immediate repair of all lacerations of the perineum and vaginal walls in a scientific manner is the keynote in the prevention of prolapse. This repair should be undertaken as soon as convenient after labor. The retracted and torn edges of the deep and superficial muscles must be united by buried absorbable sutures. The vaginal and perineal wounds must be closed. The aim should be a *restitutio ad integrum*.

The Pessary.—Just as the truss must sometimes be used for surgical hernia, so the pessary is sometimes employed in the palliative treatment of gynecological hernia.

The main principle of the pessary in prolapse and in retroversion due to prolapse is *stretching the vaginal vault* over a ring. The ring is bent in various curves so as to rest upon the intact portion of the pelvic floor. The stretched vaginal walls run over the ring as over a pulley and thereby hold up the uterus by its vaginal attachments.

Just as the truss presses on the muscular structures about the inguinal ring and tends to cause atrophy with consequent enlarge-

ment of the hernial opening, so the pessary tends to stretch the vaginal walls, and therefore to weaken still more the supports of the pelvic floor. The pessary must often be changed to a larger one.

In treatment of cases under consideration there are three general *types of pessary*.
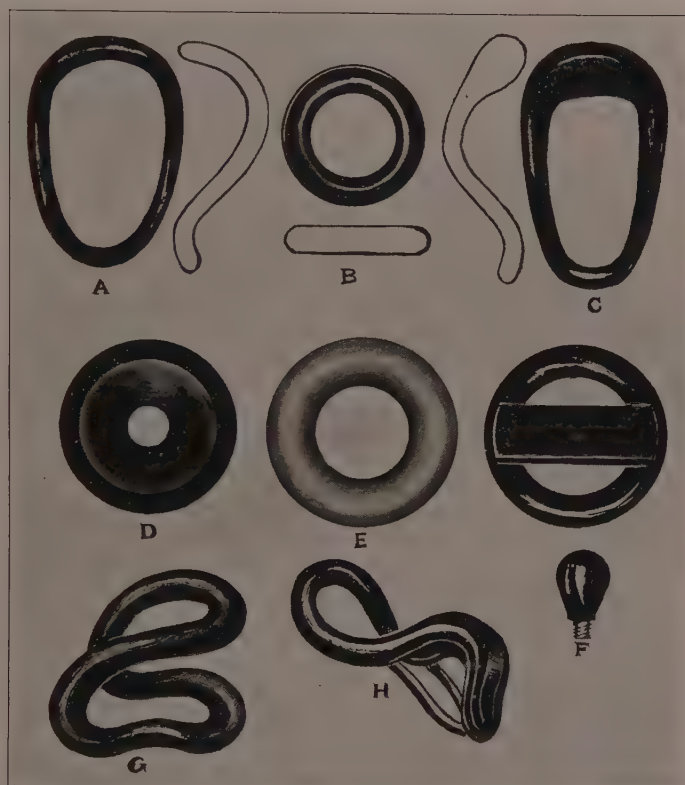
Fig. 96.—Types of pessaries. *A*, Hodge retroversion; *B*, Hard rubber ring; *C*, Thomas retroflexion; *D*, Biconcave disc; *E*, Soft rubber inflated ring; *F*, Menge retroversion and prolapse; *G*, Gerung anteflexion; *H*, Skene anteflexion and cystocele.

THE HODGE TYPE is a hard rubber ring bent, in one plane, like the outline of a pear and, in the other plane, like the letter S. It rests, like rockers of a chair, upon the sides of the lower part of the vagina, reaches by its large end well up into the posterior vaginal vault to stretch the vaginal wall, and reaches by its smaller

end almost to the urethral orifice. Its intended use was for retroversion only.

THE ROUND RING of soft rubber, sometimes called the doughnut pessary, depends for its value upon filling up the vaginal canal and acting as a soft plug to prevent descent of the pelvic contents through

Fig. 97.—Floor of pelvis showing normal levator ani and coccygeus.

the vagina. Its use is principally limited to extensive laxity of the pelvic floor, especially in old women.

THE CUP PESSARY is a soft rubber cup attached to a stem, which in turn is fastened to straps which are supported around the waist. It holds the portio vaginalis of the cervix within the cup and thereby

holds the uterus upwards in place by means of the stem and straps. It is very cumbersome and dirty, and may be a sexual excitant.

PESSARIES ARE INDICATED only when operation can not be performed. In old women with extensive prolapse, the doughnut pessary may palliate the symptoms enough to make life bearable. The Hodge may be used in younger women with less extensive prolapse
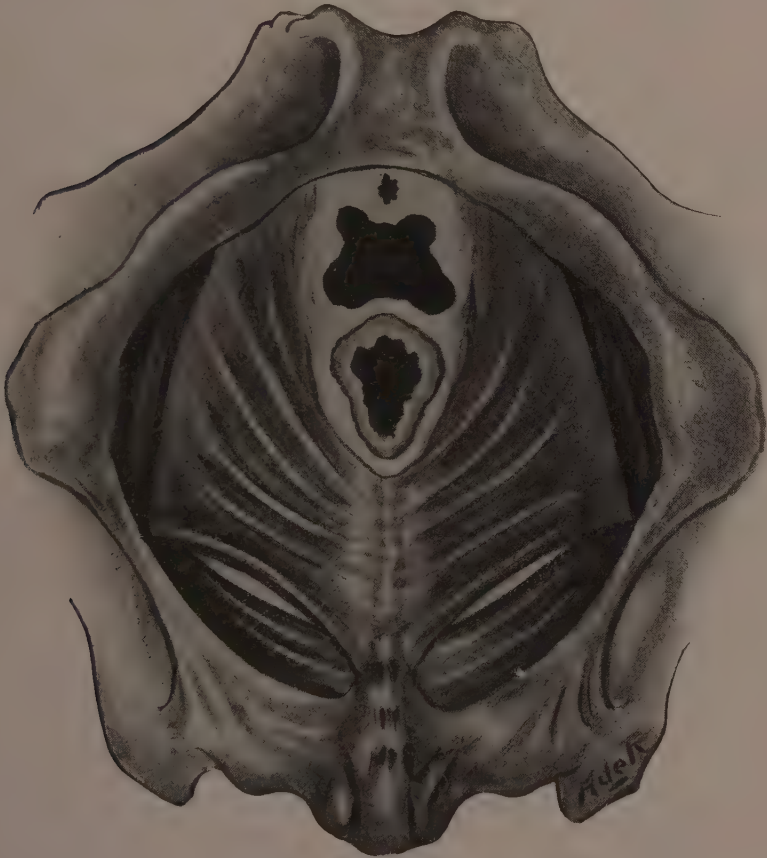
Fig. 98.—Effects on levator ani and coccygeus of deep perineal laceration.

when operation is contraindicated for scientific reasons or impossible for other reasons. The cup pessary is never indicated.

Pessaries must be removed periodically for cleanliness and to guard against ulceration. The Hodge pessary does not positively prevent coitus but of course interferes with it.

POSTERIOR COLPORRHAPHY

The principle of this operation is to dissect down to the borders of the levator and bring these margins together in front of the rectum. In addition the connective tissue of the perineal body is

Fig. 99.—Effect of approximation of muscle edges in operation.

gathered up into a mass by sutures and the vulvar orifice is made smaller. In other words the muscular and fascial boundaries of the hernial canal are brought together and the hernial opening is made smaller so as to support the pelvic organs by a repaired pelvic floor.

With toothed forceps on each side of the vulvar opening the ends of the severed carunculæ myrtiformes are marked. These forceps

are brought together to test the position of the posterior margin of the new vulvar opening. The forceps are then held apart, stretching the muco-cutaneous margin into a straight line. With a sharp
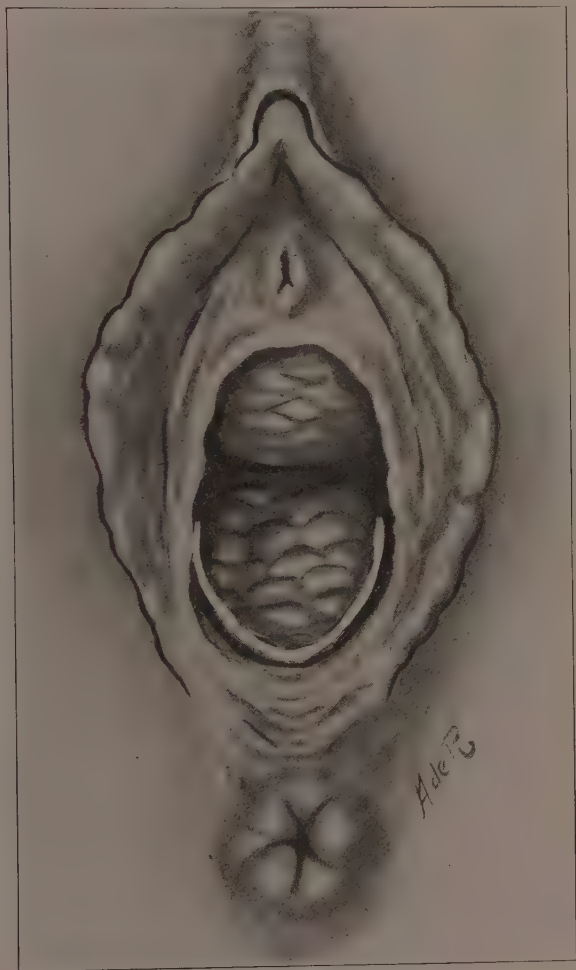
Fig. 100.—Line of incision through mucosa indicated by white line.

knife a thin sliver is removed from this edge, dividing the vaginal mucous membrane from the perineal skin. This line of wound is the basis for the denudation and dissection. The vaginal flap is separated from the rectal portion of the septum by blunt dissection

with the finger covered with gauze, aided by occasional cuts with knife or scissors. The middle of the edge of the vaginal flap is held by a catch forceps in the left hand. Dissection is made against the vaginal flap so as not to buttonhole the rectal wall.
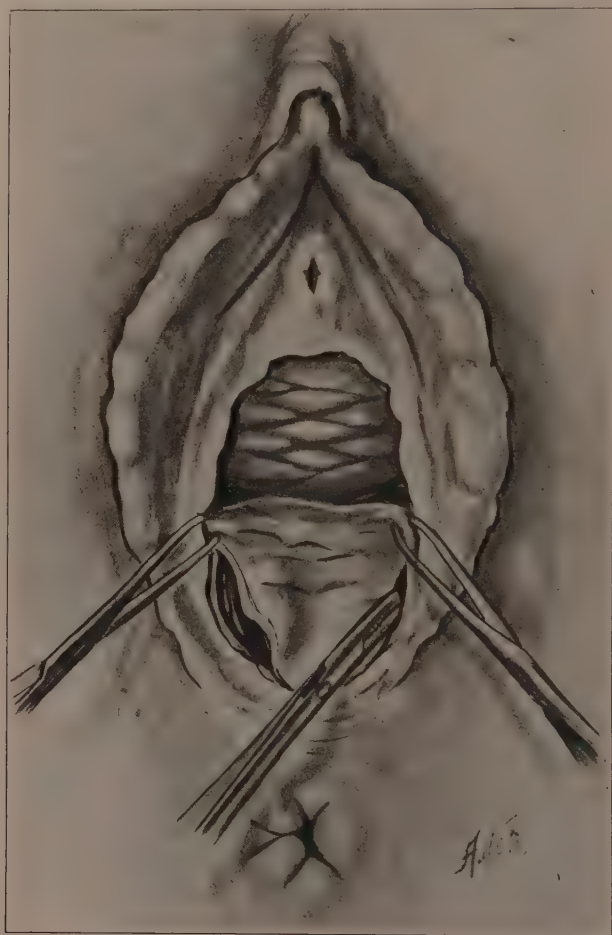
Fig. 101.—Freeing sides of vaginal flap.

When a sufficient vaginal flap has been denuded, the fingers are passed into the sides and depths of the wound above and at either side of the rectum to expose, by such blunt dissection, the margins of the levator. When these margins are well exposed, they are caught

up by forceps and sutured in the middle line in front of the rectum and below the vaginal wall. Some operators catch the margins of the levator with the needle, while the index finger of the other hand
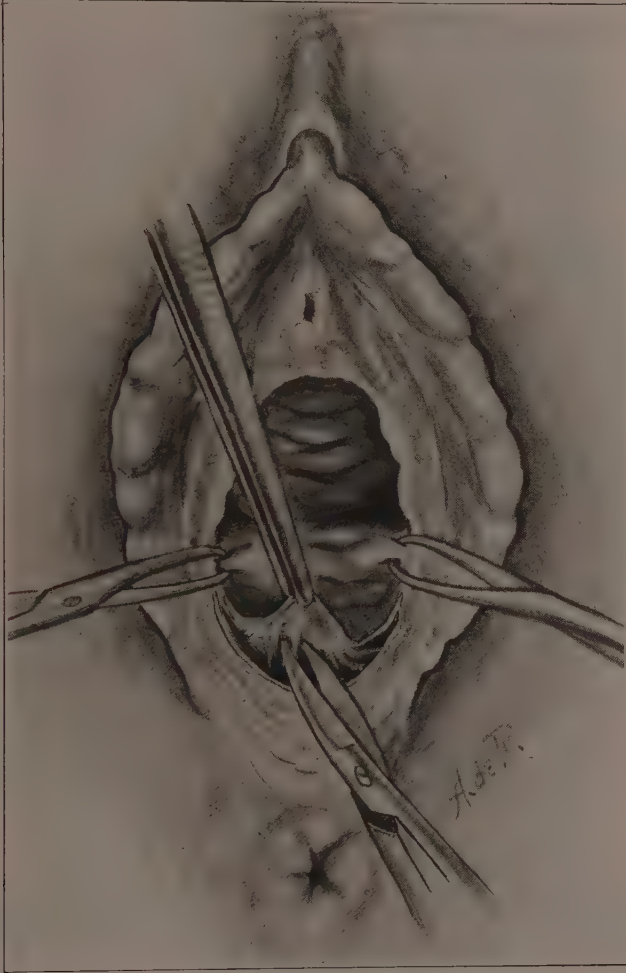
Fig. 102.—Dissecting up posterior vaginal flap.

pushes the rectum downwards out of danger. Several durable cat-gut stitches should be used for these buried sutures. Then several layers of sutures are used to bring together the connective tissue of the sides of the wound to form a perineal body.

The redundant portion of the flap of vaginal wall is trimmed away and a crown suture of silkworm gut, or catgut, is passed from one end of the vulvar incision (marked by the forceps) through and
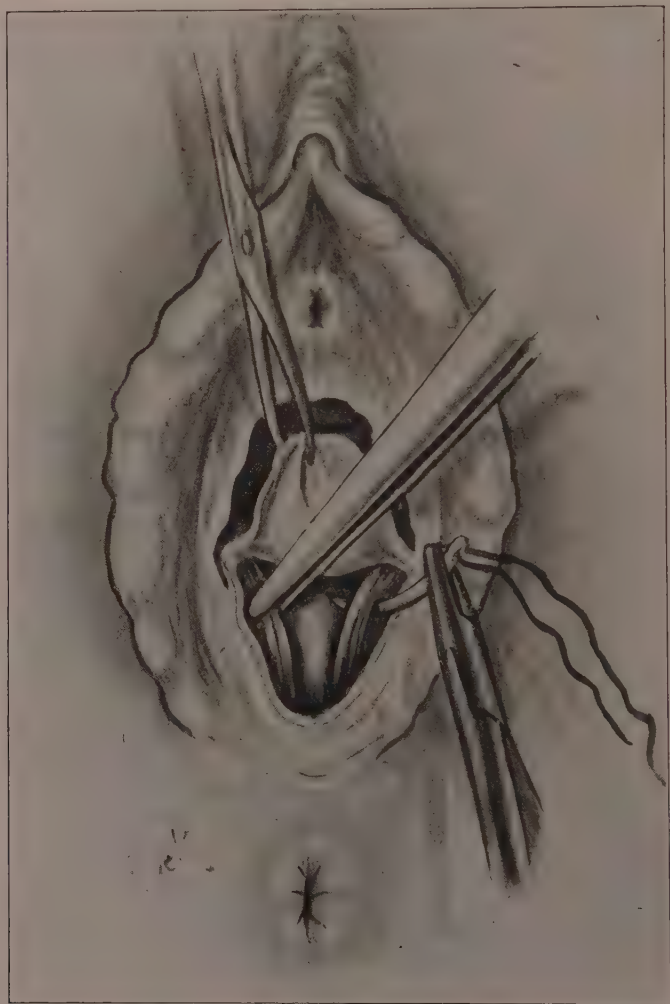
Fig. 103.—Inserting sutures in levator ani and its fasciæ.

through the edge of the vaginal flap. When this suture is tied, it brings the edges of the carunculæ myrtiformes and the edge of the vaginal flap all together to form a sort of new hymen. This crown

suture, however, is not tied until the skin sutures have been placed in the perineum.

The external sutures in the skin of the perineum are often of silk-
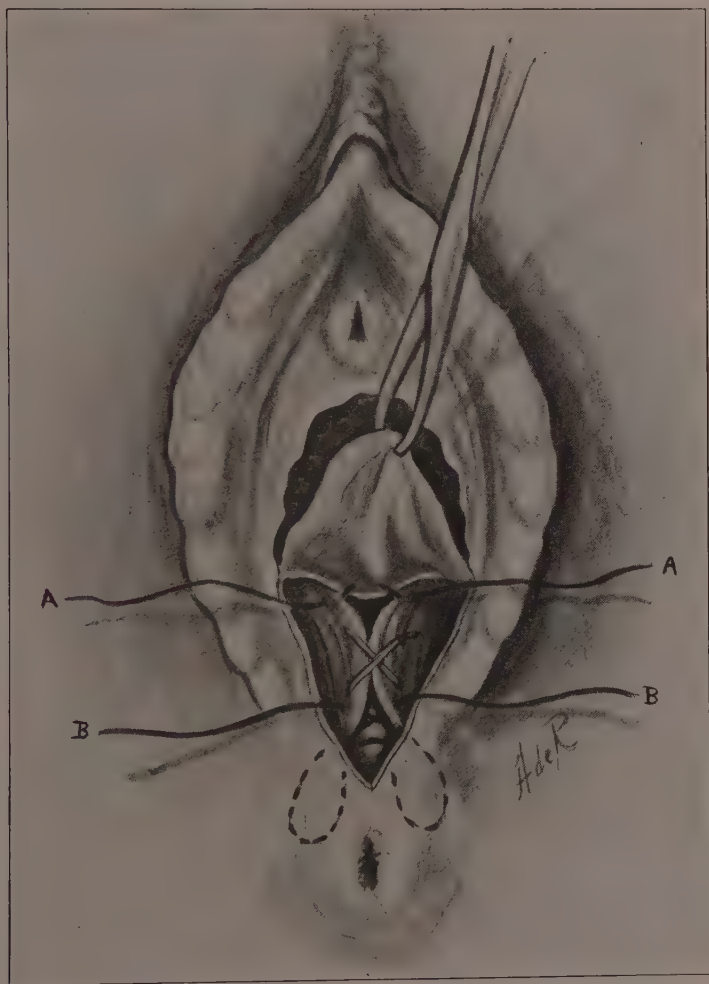
Fig. 104.—Suture in levator tied. Musculovaginal suture, *A;* and suture to approximate divided ends of sphincter *B,* inserted.

worm gut. They should be passed from near the anus progressively upwards towards the vulvar margin at the point of the crown suture. They should include the skin and also the deep tissues which have

already been brought together by the buried sutures previously passed. The skin sutures should be tied from below upwards, and the crown suture last.
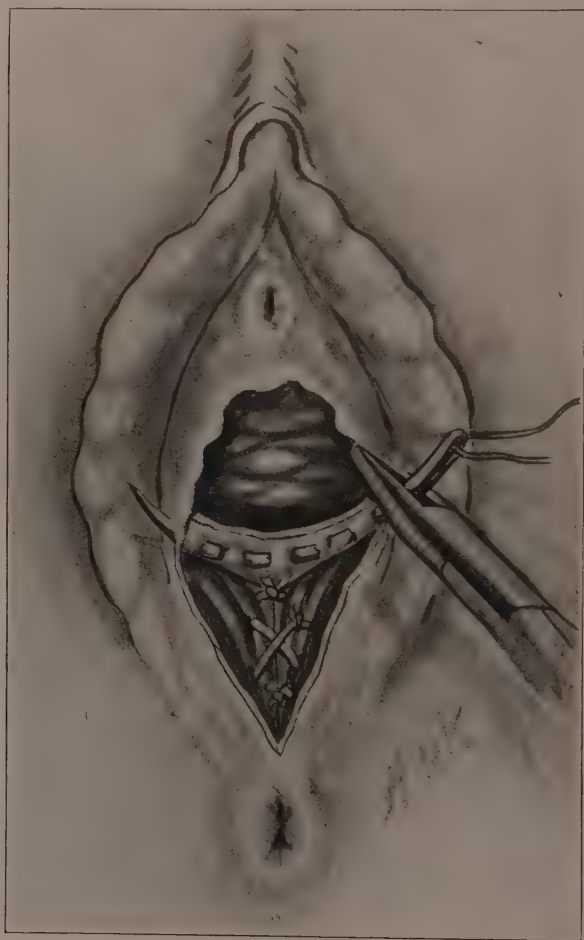
Fig. 105.—Inserting suture through base of vaginal flap.

When all sutures have been placed and tied, it will be seen that the anus, perineum, and posterior vulvar margin have been brought well forward towards the pubes, and the vulva has regained its normal size and appearance; the vaginal canal has been reduced in cali-

ber, and the margins of the levator ani have been sutured between the posterior vaginal wall and the rectum. Thus the hernial canal has been narrowed and a posterior muscular support has been furnished.

It is true that the parts have not been restored to their exact nor-

Fig. 106.—Operation completed.

mal condition. The same objection applies to repair of any hernial opening anywhere. Such a complete restoration, although a consummation greatly to be desired, is impossible with any secondary operation. It must be remembered that the torn fibers of the levator ani

have long since retracted and atrophied, like any muscular fibers
severed from their attachments. The fibers of the margins of the
levator have been brought together between vagina and rectum and
the levator ani sling has been shortened.

ANTERIOR COLPORRHAPHY

Where there is considerable cystocele, the anterior vaginal wall
must be diminished in extent. This is done before beginning the
posterior colporrhaphy. First the cervix is pulled down to the vulva
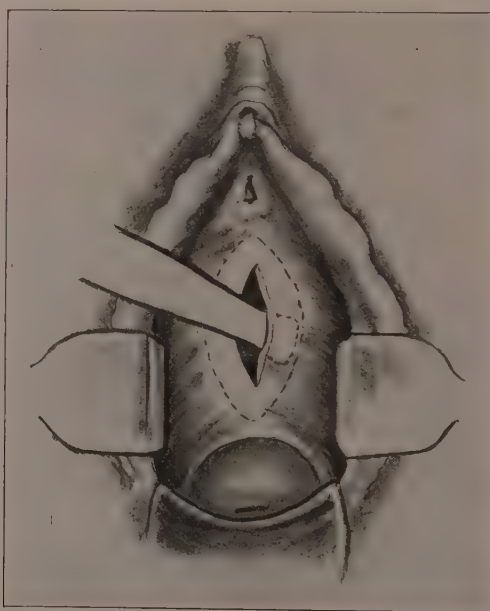
Fig. 107.—Cystocele operation. Isolating redundant mucosa.

by a vulsella. A longitudinal incision is made in the anterior vaginal
wall through the mucous membrane, running from a little below the
urethral orifice nearly to the anterior part of the cervix. The
vaginal mucosa is dissected away from the deeper structures in an
area of lenticular shape, and the redundant flap is clipped away.

Sutures are passed from side to side through the margin of the
mucosa, through and through the subjacent tissues, to come out at
the margin of the mucosa on the opposite side of the denuded space.

As many sutures as necessary are thus passed and tied. Sometimes, if the denudation is extensive, some of the subjacent tissue is first united with buried sutures. Then the diminished raw area is united as already described. The result is narrowing of the redundant anterior vaginal wall and elimination of the cystocele.

If the cervix is much hypertrophied it is well to perform amputation. Sometimes, in elderly women, with complete prolapse of the
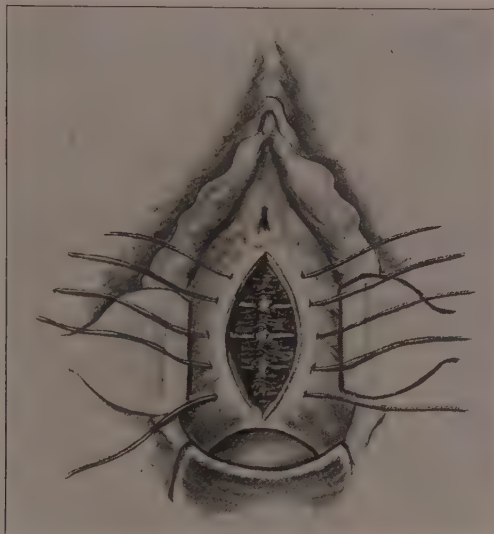
Fig. 108.—Cystocele operation. Sutures inserted but not tied.

uterus (procidentia), it is advisable to remove that organ by vaginal hysterectomy. Such an operation, of course, does away with the prolapse of the uterus. Unless, however, the pelvic floor is repaired, the gynecological hernia will not be corrected, because the remaining contents of the pelvis, usually the intestines and omentum, will come down through the defect and will pouch out the vaginal walls. Therefore, when hysterectomy is done on account of prolapse, it is also necessary to repair the pelvic floor just the same.

CHAPTER XI

INFECTION OF THE FEMALE GENITALS

ETIOLOGY

In the **new-born** there are normally no microbes anywhere within the body for several hours after birth. The genital canal is free from any bacterial growth for six to twenty-four hours. Within the first two weeks it is rare to find any gelatin-liquefying microbes within the genital tract. Within a shorter time, however, the *lactic acid forming bacilli,* which are normally found throughout life within the vagina, have made their appearance and at even such an early stage in life have begun their work of keeping the canal cleared of any noxious germ life which may gain entrance.

With the exception of these beneficent microbes, the female genitals above the hymen, under normal circumstances, contain no other bacteria for any extended time. The lactic acid and probably other metabolic products of the normal tenants of the vagina keep it aseptic by destroying invading microbes.

In **breech presentations** there is greater chance of infection of the genitals of the child than in other presentations. This is because the examining finger of the obstetric attendant may easily infect the vulva and vagina of the child during its passage and also because the partly open genitals may scoop up infectious material as the advancing breech is forced through an infected maternal canal. Such is a frequent source of gonorrhea in the new-born. After birth the genitals of the female infant may become infected by unclean clothing, unclean bath water, filthy sponges, infected bedding, infected towels, and fingers of nurses.

Menstruation is a period when there are more microbes in the vagina than at other times and when it is more difficult for the normal bacilli to overcome them because the alkalinity of the menstrual blood neutralizes the lactic acid. The presence of the menstrual discharges in the vagina and vulva favors the growth of bacteria in the culture medium thus supplied.

Catching cold during the menses is considered by the laity a frequent cause of all sorts of gynecological ailments. When the origin of the disorder is at the time of the menstrual period, it is more likely that it is due to the greater chances of infection then.

Coitus, involving, as it does, the introduction into the vagina and through the vulva of a septic foreign body and the frequent slight traumatisms incident to the act, is not an uncommon source of infection, especially at or near the time of the menses.

Pregnancy seems to be a time when infection is not very likely to occur. It is a period when there is a greater action of the immuniz-
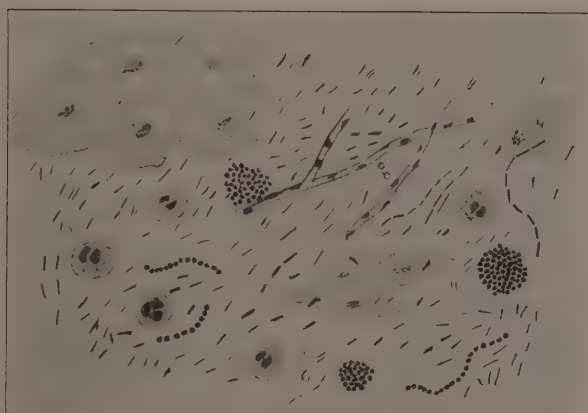
Fig. 109.—Normal flora of vagina.

ing factors than at other times, and also when there is diminished chance of entrance of infection from the vulva. Williams showed by his experiments that the normal bacilli in the vagina of pregnant women were especially active in destroying microbes experimentally introduced.

The **puerperium** is a time when the exposure to infection is great, and when infection, which entered at the time of the labor, finds extensive traumatized areas to attack. During the passage of the fetus through the parturient canal, more or less extensive and numerous lacerations are inevitable, even in the most thoroughly normal labor. The traumatism and consequent liability to infection are immensely increased if the delivery has been aided by artificial means, especially instrumental.

Abortion is a prolific source of infection. There is less natural immunity of the maternal organism after abortion than during the puerperium following full-term labor. If spontaneous, the abortion finds the cervix less able than at full term to dilate normally, and therefore more liable to lacerations. If the abortion is induced, there is a great chance of infection from septic instruments or from the operator's hands.

The infection usually begins at the lacerated places of the cervix and spreads by way of the lymphatics to the parametrium, paracolpium or broad ligament. It may attack first the endometrium and spread by continuity of mucous membrane, throughout the lining of the uterus and cervix or to the tubal mucous membrane.

The **rectum** is a more frequent source of infection of the genitals than is usually supposed. In cases of chronic constipation, a subacute peritonitis of the cul-de-sac of Douglas or of the peritoneal coat of the tubes and posterior surface of the uterus may ensue because of migration of the colon bacilli and other denizens of the rectum through the rectal wall. This form of peritoneal infection often causes the formation of adhesions and fixed retrodisplacements of the uterus. These results are not very uncommon in the unmarried, or even in virgins.

The **appendix** is a common source of infection of the female genitals, especially of the tubes and ovaries. This little portion of the intestinal tract, riding freely at anchor by its mesentery, has a very wide range of location within the abdomen and pelvis. The pathological lesions in an inflamed appendix often remain for a long time at its distal end. This end, especially when the organ is long and has a long mesentery, may be located deeply in the true pelvis and may attach itself to the tube, ovary, uterus, or broad ligament.

The entrance of infection thence into a pelvic viscus is easy and not uncommon. The right tube and right ovary, for obvious reasons, are more often thus infected. Conversely, an infected tube or other portion of the genital apparatus may be the source of infection of an appendix.

The most important, if not the commonest **microbe** infecting the female genitals, internal and external, is the gonococcus. Next come the streptococci of ordinary septic infection (those producing pus). Infection by staphylococci is commonest in the vulvar region. The saprophytic putrefactive microbes are not infrequent agents of infection, often in company with other germs. The micrococcus catarrhalis,

the colon bacillus, the tubercle bacillus, and the gas-forming bacillus are other infectious agents often concerned.

CATARRH

The word catarrh means a flowing down, and is applied to an excessive secretion of mucus. Anything that causes a moderate *hyperemia* of any gland or secreting structure causes an increase in the amount of secretion by that gland. Hyperemia of mucous glands causes excessive action of the epithelial cells which secrete mucus. Therefore there is a catarrh with any moderate type of inflammation.

Increased secretion and discharge of mucus may also follow hypere-
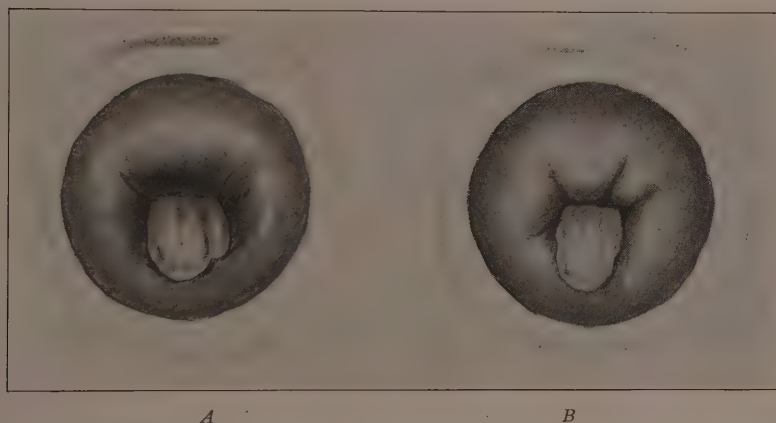
Fig. 110.—*A.* Gonorrheal endocervicitis. *B.* Simple endocervicitis. (From preparation in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

mia from other causes. Therefore we observe a catarrh in most cases of *passive congestion* due to anything which gives rise to local venous stasis. Such causative factors are found in most chronic cases of salpingitis, metritis and peritonitis—even in the postinfective stages, when adhesions and other cicatricial conditions remain. In prolapse of the genitals it is also found.

Acute and subacute infections of mucous membranes and of the organs containing them often leave the blood vessels permanently dilated, and therefore congested; so we may observe a catarrh long after all microbes have ceased to infect the parts. Indeed, physiological or nervous stimuli may cause increased flow of mucus. Such, for

example, is observed in the discharge from all the mucous glands of the female genital system at the time of the sexual orgasm.

Catarrh is not a pathological entity, but a *symptom* of many states, pathological and physiological. The term catarrhal inflammation is an incorrect term.

GONORRHEA

Since more than fifty per cent of all infections of the female genitals are caused by the gonococcus, it follows that gonorrhea is the most important infectious disease in gynecology. Although recognized for centuries as a definite disease of the male, gonorrhea has only comparatively lately been studied as a definite entity in the female.

Before the discovery of the gonococcus by Neisser in 1876, gynecological writers wrote of catarrh of the female, and of vaginal catarrh. Men were supposed to contract gonorrhea from intercourse with unclean women, from women with leucorrhea, and from menstruating women. The specific nature of gonorrhea was denied even as late as 1872, and even ophthalmia neonatorum was supposed to be caused by any kind of a leucorrhea.

At this date Nöggerath published his work on latent gonorrhea in the female, and argued that it was an infectious disease acquired from men who had it in a latent and incurable form. Bacteriology proved the truth of Nöggerath's main thesis, although modern opinion does not entirely agree with his ideas as to the incurability of gonorrhea in the male.

Etiology and Pathology

Gonorrhea is essentially an inflammation of mucous membrane caused by the growth upon it and within its cells of a specific coccus, discovered by Neisser and called the *gonococcus*. This microbe is usually found double, in the shape of two coffee beans with their flat surfaces in apposition. Hence it is called a diplococcus. A transparent area surrounds both cocci, and lies between them. The cocci take deeply the basic aniline stains, but the transparent area does not color. The germ in its growth resembles the staphylococcus rather than the streptococcus; that is, it grows in bunches instead of in chains.

Reproduction is accomplished by *fission* through the thin part of each "bean" with consequent formation of two new "beans;" new

diplococci. The microbe averages in length about 1.25 micromilli-
meters. It grows chiefly between the epithelial cells and within the
leucocytes, which it infests in great numbers. Distinctly parasitic,
its habitat is the human body.

It grows best upon agar containing human serum, ascitic or hydro-
cele fluid, or upon media containing peptone, but is very hard to
cultivate in artificial media. It has been inoculated upon human mu-
cous membrane and is inoculable in few other animals.

The main reliance in the detection of the gonococcus is upon its
shape and staining qualities. The most practicable stain is Löffler's
solution of methylene blue. It decolorizes by the method of Gram, and
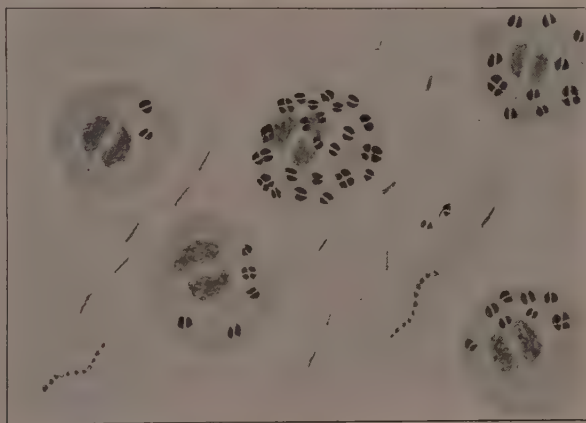
Fig. 111.—From cervical smear showing gonococci.

thus differs from almost all other diplococci of its size and shape.
Medico-legal differentiation, however, might require culture experi-
ments. The crucial test of Koch, namely, inoculation of pure artificial
cultures into animals, and production of the original disease in them,
is difficult except when man is used for experimentation. Inocula-
tions are sometimes made upon the conjunctivæ of rabbits or upon the
peritoneum of guinea pigs.

Outside of the human body the gonococcus is not very hardy. It
does not stand drying, growing only sparingly after several hours and
not at all after twenty-four hours. Therefore clothing and other
fabrics infected by the microbe become innocuous soon after thorough
dessication.

If kept moist, the gonococcus retains its vitality at temperatures slightly above or below that of the body. It grows best at body heat. Cultivation on artificial media for as many as twenty generations has resulted in gonococci which have produced gonorrhea in the male urethra, but beyond that the bacteria lose their virulence and will no longer produce the disease.

In or on the mucous membrane of the human body the gonococcus indefinitely retains its full virulence for healthy mucous membranes of other persons. This fact is well illustrated by the great virulence of gonorrheal infection of the conjunctiva of the new-born by germs which have long been latent within the genital passages of the mother.

Reinfection is not infrequently observed. It is believed that germs latent in the male urethra, which have caused no symptoms for a very long time, may infect a woman with an acute gonorrhea. The gonococci in her genitals may become so virulent that they will reinfect the man with an active attack.

On the other hand, gonorrheal pus in closed abscess cavities, such as pus tubes, soon becomes sterile because of the death of the gonococci for want of renewed food supply. Tubes removed for pyosalpinx, even a few weeks after the onset of the acute attack, are usually found to contain pus which shows no microbes. Indeed, it is exceptional for the pus from such tubes to infect the peritoneum and surrounding tissues, even when spilled during the operation. Such is not the case, however, when there is a mixed infection with septic bacteria, to which the peritoneum seems to be more susceptible.

The *toxin of the gonococcus* seems to be retained within the body of the microbe itself. Filtrates of the cultures seem to contain none, yet the dead microbes themselves will produce symptoms similar to those of an acute gonorrheal attack, although of very short duration.

An excellent explanation of the *apparent paradoxes of gonorrhea* is furnished by the theory of G. Frank Lydston, who, many years ago, made it known to the profession. Virulence of gonorrheal infection depends upon two main factors; adaptations of the succeeding generations of the microbe to changing environment—especially food supply—and susceptibility of the cells of the host. A long-standing chronic gonorrhea of the male urethra may become so nearly cured that it causes no symptoms. In other words, it is latent.

The few inactive gonococci in the deep follicles, or perhaps hidden in the recesses of the prostate, Cowper's glands, or seminal vesicles, may in succeeding generations have become so changed by the conditions of their environment that they are no longer virulent, or even pathogenic to their host. They have become a race of germs different from their ancestors, in their physiological characteristics, even if unchanged in their morphology. The so-called micrococcus catarrhalis perhaps may be the parent of a noble line of gonoccoccal descendants, which may finally revert back to the simpler and less virulent type from which they sprang.

Let us suppose that the man marries and indulges excessively during the honeymoon. The genital organs become congested from the sexual excitement and the microbes within the passages secure an increased food supply. Perhaps also the muscular spasm incident to frequent orgasm empties the crypts and follicles of the urinary passages of the germs contained within. There is also an increased secretion of mucus on account of the accelerated blood circulation.

All conditions combine to supply food favorable to the rapidly proliferating generations of germs and the strain of bacteria present rapidly regains its former virulence. New portions of the genital tract, which had formerly been immune to the innocuous generations of the gonococcus, may now become infected and an acute gonorrhea result. Even before the symptoms of recrudescence of the gonorrhea appear in the man, some of these germs of the newly awakened generations of gonoccocci may be transferred to the woman's genital tract.

The **objective symptoms** of the disease may not appear at the same time in both the man and the woman. Indeed, because of the virgin soil in the woman, the disease will develop more rapidly in her. Thus may be explained some or all of the cases of apparent reinfection of the male by his partner. It may not be reinfection, but a coincident infection of both male and female genital passages by microbes already within the male passages, enormously changed in their virulence by reason of changes in their environment.

The question of food supply and other factors of environment come into play in reference to the *menstrual phenomena.* Gonococci may remain latent within the cervical canal, for instance, until the congestion and discharges of menstruation furnish them the environment favorable to the production of virulent generations. Therefore a

woman may become infected by a man and not show it until one or more menstrual periods have passed.

The gonococcus infects intact mucous membrane. Unlike most infective agents, it does not require a solution of continuity in order to gain entrance to the tissues of the body. The thinner and softer the mucous layer is, the more readily and the more severely is it attacked by the gonorrheal germ.

The many-layered squamous epithelium of the adult vagina is less easily infected and more quickly recovers than the thin tender lining of the vagina of a young child. Columnar epithelium, such as lines the glands, the endometrium, the tubes, and the urethra is most susceptible to gonorrheal infection. The mucous membrane of the rectum is usually protected by the closure of the anus but, when gonococci do gain entrance, an exceptionally severe infection results.

Coitus is the chief factor in the acquirement and spread of gonorrhea. If there is a visible discharge from the male urethra, infectious matter from it may be rubbed into the female urethra or into the ducts of the vulvar glands during the passage of the glans penis into the female genital canal. Some may be deposited in the vaginal vault in the same manner.

The motions of the penis may force into the male urethral canal germs which have been deeply hidden within the recesses and these may be flushed out and evacuated into the upper vagina with the seminal ejaculation. The cervical mucous membrane may then easily become infected through passage of this material through the external os.

For these reasons the *primary infection* of the female with gonorrhea is commonly in the *urethra and the cervical canal.* Usually infection of other portions of the genitals is the result of extension and is secondary. Therefore, as new parts of the genital tract become infected, new exacerbations of the disease appear, exhibiting signs and symptoms dependent upon the anatomical and physiological peculiarities of the individual part.

Other causal factors in gonorrheal infection are masturbation, closet seats, bath water, towels, soap, sponges, bedding, diapers, clothing, and flies. While these latter sources are rare in the adult, they often appear in children and infants. Gonorrhea is often epidemic in an institution or a family. Infection may result from examination by the physician. His hands may not have been sterilized since examin-

ing a previous case, his specula may be unclean, his tampons or other paraphernalia may be infected.

In women the period of *incubation* of acute gonorrhea is not always easy to determine. The time of the infective coitus is frequently indeterminable. The first appearance of symptoms may be unnoticed until the discharge becomes profuse and troublesome. Many women, especially those accustomed to frequent intercourse, habitually have a discharge of mucus, more or less clouded with leucocytes, which obscures for them the beginnings of an inflammatory discharge. Therefore the period between the actual acquirement of the infection and the reporting of the symptoms may vary from one day to several weeks. On the other hand, experimental inoculations with pure cultures of the gonococcus upon the mucous membrane of the female genital tract show appearances of inflammatory reaction within from twelve to thirty-six hours.

Microscopic detection of gonococci in the tissues is difficult and tedious. The small microbes are hard to distinguish in stained sections. The cocci quickly establish themselves in the cement substance between the epithelial cells. They also invade the cells themselves to a limited degree and are found in large numbers within the leucocytes both of the tissues and of the pus. The germs rarely reach deeper than the superficial layers of the connective tissue portion of mucous membranes. The disease is essentially a superficial process; consequently infection of the deeper tissues by way of the lymph channels, formation of gonorrheal abscesses in the areolar spaces, and metastases are rare.

The appearances in the urethra are typical, with certain modifications, of those elsewhere in the genital tract. In the acute stages the gonococci extend between the epithelial cells into the lower layers. A marked emigration of white corpuscles from the capillaries leads to a moderate destruction of epithelium. Cocci can be found in the superficial portions of the connective tissue. Later, when the urethral secretion contains much exfoliated epithelium, the infiltration with leucocytes confines itself to the upper surface of the connective tissue, which is now free of cocci. The germs finally lodge between the layers of epithelial cells and, in chronic cases, collect in localized areas.

In the cervical canal there is a great development of glandular hyperplasia and infiltration of the interglandular tissue with leucocytes. The cocci are found between the epithelial cells, extending as

far as the connective tissue of the endocervix. The superficial epithelial cells of the glands are often in part changed to cells somewhat resembling flat epithelium. The deeper cells of the glands remain intact throughout.

Infection of a gland sometimes closes the mouth and converts the gland into a cystic cavity, the so-called ovulum Nabothi. Where the cylindrical cells remain intact, few or no gonococci are found. The latter are found in those regions of the endometrium and endocervix where the epithelial cells have undergone more or less of a metaplasia into cuboidal or flattened cells.

Gonorrheal infection of the tubes in the acute stages is limited
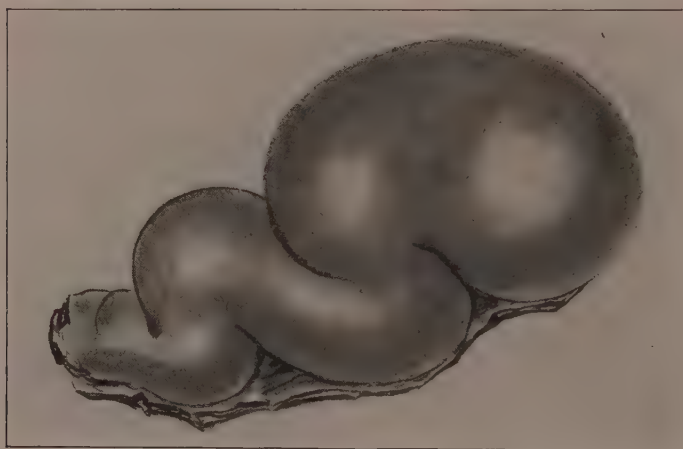
Fig. 112.—Pyosalpinx. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

mostly to the epithelial lining. This is reddened and in places covered with masses of leucocytes and fibrin. Drops of pus exude from the ostium into the abdomen, setting up adhesive inflammation which ultimately causes adhesions of different parts of the peritoneal membrane. The abdominal end of the tube is soon closed, and the secretion accumulates within because of the small caliber or actual occlusion of the uterine opening.

Thus is formed a **pyosalpinx**, the pus of which soon becomes sterile. In places the epithelial lining is exfoliated. On the other hand, one or both of the abdominal ostia may not close, some of the secretion may be evacuated and the rest may become absorbed so that

the tube may recover its former integrity, except for the areas where the epithelium has become eroded.

In some pyosalpinx sacs of moderate dimensions the pus may be absorbed and the wall become thickened by infiltration of the connective tissue of the tube and of its folds, especially in those cases where there has been extensive exfoliation of epithelium. Meanwhile the gonorrheal pus from the tubal ostium abdominale usually infects the peritoneal coating of the surrounding or adjacent pelvic organs. Therefore the tubes and ovaries become involved in adherent masses behind the uterus, become adherent to the posterior or lateral pelvic
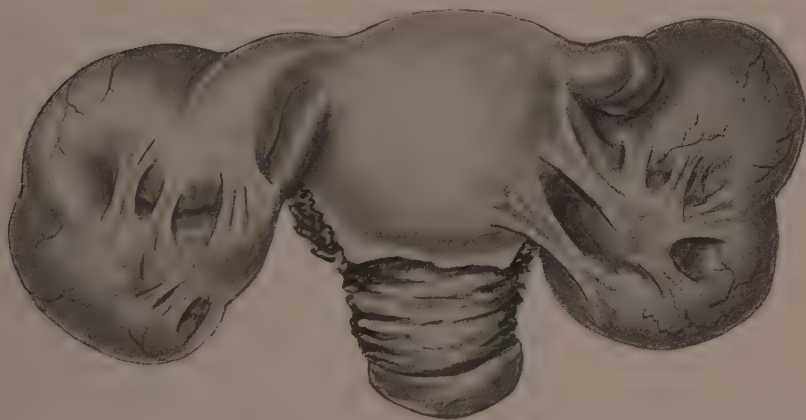
Fig. 113.—Bilateral pyosalpinx. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

wall and the rectum, and bind the uterus backwards towards the cul-de-sac of Douglas.

Omentum often becomes enmeshed in the general mass and sometimes a tumefaction of considerable size is formed which is easily apparent by vaginal examination. The ovarian follicles or the corpora lutea may become infected secondarily from the tubal gonorrhea, and *ovarian abscesses* may be formed. The septum between a pyosalpinx and an infected ovarian follicle may slough, and thus a *tuboovarian abscess* is formed.

Occasionally gonococci penetrate to the connective tissue of the parametrium and of the pelvis in general, and form *abscesses within the areolar spaces*. Nonperitoneal pelvic abscess and pelvic cellulitis is

more common as a result of infection with streptococci and staphylococci than with gonococci.

Mixed infection of the mucous membranes and tissues of the genital canal is not often proved in acute gonorrhea but is frequently observed in chronic cases.

The *vulvovaginal glands* are most prone to mixed infection in gonorrhea. The inflammatory reaction is more marked and more destructive, and extends deeper into the neighboring connective tissue than in cases of pure gonococcal infection. In these cases a generous incision and proper drainage will usually permanently cure the trouble, because the epithelial lining of the duct and gland has been destroyed by the other pyogenic cocci.

In the pure gonorrheal cases, it is more often necessary to dissect out the gland in order to effect a permanent cure because the gonococcus is less destructive to the mucous membrane and often leaves behind enough intact epithelial lining to reform the cyst of the gland.

Mixed infection is more likely to cause *pelvic cellulitis* and abscess of the pelvic connective tissue than is gonorrheal infection alone. Many of the complications of gonorrhea are due to the mixed infection.

Occasionally the *gonococci enter the lymphatics* or the blood vessels, usually because of a local ulceration, and are carried in the blood stream or may even multiply in the blood—true septicemia or gonococcemia. Thence may arise arthritis, endarteritis, or even endocarditis, as in rheumatic infection. A pyemia due to the gonococci has been observed.

The *gonorrheal arthritis*, so-called gonorrheal rheumatism, usually affects one joint at a time, commonly a large one. The process is essentially a periarthritis and consists of a serous exudate in the connective tissue around the joint, and sometimes increase of the fluid within the joint itself. Within the periarthritic exudate the diplococci are found. Tendinous structures may also become involved in such a gonorrheal infection. Sometimes the eye is affected.

Symptoms and Clinical Course

Gonorrhea of the female plays in different individuals such vastly different roles that it is hard to define clearly the symptoms and physical signs typical of an acute attack or of the chronic forms of

the disease. It varies in severity from a merely uncomfortable discharge, containing the gonococci, and disappearing in a few weeks, to a profound systemic cataclysm, with threatening onset, rapid extension throughout the genital apparatus, incurable lesions, and ruined general health.

From the standpoint of symptomatology, gonorrhea in women is best studied from a consideration of its behavior in connection with the individual organs of the urogenital system.

URETHRITIS

Gonorrheal urethritis of greater or less extent is a regular accompaniment of the early stages of the infection. For three or four days the symptoms and appearances are similar to those in urethritis of the male. There is pain and burning on micturition, redness of the mouth of the urethra with eversion, hyperemia, and exudation of creamy pus. The course of the urethra as far as the bladder becomes swollen and tender. Pus can be milked from it by stripping with the finger in the vagina. There is frequent call for urination during the day and night, with tenesmus before and after. Sometimes there is nervous retention of urine. The symptoms rapidly disappear in most instances, much sooner than in man, and usually without or despite treatment.

The **objective signs** also disappear in from two to four weeks, except where the infection has reached the *periurethral (Skene's) glands*. In such cases there is a persistence, often for months, of the exudation of pus on milking the urethra. It often happens that the disease ceases after disappearance of the manifestation in the urethra and no traces of the gonococci are longer demonstrable. Many of these cases, however, are still infectious.

A **chronic gonorrheal urethritis** in the female is the exception, and urethral stricture is a rarity. The short, comparatively wide, and straight urethra of women allows good natural drainage which is not afforded by the long curved canal of the male. Unless meddlesome treatment has been employed, the infection of the urethra tends to recovery. There is seldom extension to the bladder.

Cystitis due to unmixed infection by the gonococcus is rare. The cases of pyelitis in women accompanying or following gonorrhea of the urethra are almost never due to the gonococcus but more often to the staphylococcus and the colon bacillus.

VULVITIS

The squamous epithelial cells of the *adult* vulva are not very susceptible to infection by the gonococcus. The soft tender epithelium of *children* offers a better field for its culture. However, when the vulva, with its numerous recesses and folds, is bathed in stagnant gonorrheal discharge from the urethra or from the cervical canal, the epithelial coating may be eroded and the subjacent tissue infected. The lesions usually heal rapidly when strict cleanliness is observed.

In gonorrhea of the vulva, the labia minora, the inner surfaces of the majora, the glans and prepuce of the clitoris, and the vestibule are reddened, swollen, and edematous. Eroded places are seen which readily bleed when disturbed. The flat epithelial cells become macerated by the discharges. The inguinal glands are likely to be swollen and tender. Sometimes they suppurate, especially when the infection is mixed.

Eczema of the skin of the labia majora and even of the thighs and buttocks may be caused by the discharge. The passage of urine irritates the eroded areas of the vulva and surrounding skin, causing much burning or even deep seated pain.

The small mucous and sebaceous glands of the vulva may become infected by the gonococcus. A *follicular vulvitis* sometimes results, giving the appearance of numerous red dots like flea bits over the mucous membrane, each due to the everted lining around the little mouth of the gland. Such spots are sometimes called gonorrheal macules. These glands heal rather slowly and often serve as nests for reinfection of parts already healed or new infection of parts which have hitherto escaped.

Gonorrheal infection of the *vulvovaginal (Bartholin) glands* may exist at any stage of gonorrhea. It is more common in the chronic stages, secondary to infection by discharges from elsewhere in the genital tract. The infection is usually bilateral, although it is common for first one and then the other to be inflamed. Often the glands apparently heal and then become infected again. Abscess due to occlusion of the ducts appears in about one-third of the cases of infection of these glands.

In infection of the vulvovaginal glands the mouths of the ducts are seen, in the acute stages, to be swollen and reddened. They appear

as red spots just outside of the hymen or its remains, and on either side of the posterior third of the ring. The enlarged gland can be seen swelling into the posterior third of the labium majus of the affected side and can be felt as a hard or semifluctuating tumor.

It is usually tender on pressure. Often the tenderness is so ex-

Fig. 114.—Abscess of vulvovaginal gland.

treme that sitting or walking causes excruciating pain. Coitus is unbearable. Pain and tenderness are greatest in cases of mixed infection and least in those of pure infection by the gonococcus.

As in other closed mucous cavities, the gonorrheal abscess of the vulvovaginal gland may become sterile and its contents largely serous—the *Bartholin cyst.*

VAGINITIS

In adults true *gonorrhea of the vagina* is even more rare than gonorrhea of the vulva, although it is comparatively common in infants and young children. The flat epithelium of the adult offers resistance to entrance of the germ. Stagnation within the vaginal canal of pus from a cervical gonorrhea often causes a secondary localized or patchy infection of the vagina. This is commonly located in the posterior vaginal fornix. The areas are small, irregular and entirely surrounded by healthy mucosa.

The *discharge* found within the vagina usually comes not from that organ itself, but from the cervix and uterus above. The so-called *granular vaginitis* sometimes observed in cases of cervical gonorrhea is due to erosion of the flat epithelium which reveals the papillæ of the submucous layer.

ENDOMETRITIS

The uterus is a favorite seat of gonorrheal infection. The infecting microbes enter during coitus directly into the cervical canal or are deposited in the vault of the vagina, where they are in direct relation with the external os. The mucous secretion from the cervical glands, which often flows outwards into the vagina and is especially abundantly secreted under the influence of the sexual orgasm, serves as a splendid collector of gonococci, and favors their entrance into the cervix.

A woman may be comparatively free from gonococci, yet they appear during sexual excitement and contact, and immediately following menstruation because the increased flow of mucus washes them out into the vagina, where they may be collected for examination.

A woman is *more infectious at the time of the menstrual flow* for two reasons: first, the flow of blood washes the microbes hidden in the crypts of the uterus and cervix into the lower passages; second, the germs receive an augmented food supply because of the congestion, and rapidly increase in virulence and numbers. Hence there is some scientific explanation of the popular myth that a man can acquire gonorrhea from cohabitation with a menstruating woman.

In *acute cervical gonorrhea,* the portio appears in the speculum swollen, inflamed, glistening, and reddened, while from the os protrudes a deep red fringe of everted mucous membrane. Pressure of

the examining finger upon the portio causes pain. Bodily movements may be painful. The gonococcus may be detected by the microscope in smear preparations properly stained. The cocci will be found abundantly in the bodies of the leucocytes, and free in the fluid portions of the discharges, more sparingly within the exfoliated epithelial cells from the cervical mucosa.

When the *uterine canal above the internal os* becomes infected, the whole corpus uteri is often painful to touch, and sometimes slightly enlarged. It is, however, uncommon for the uterine mucosa to be infected with gonococci at the same time as the acute manifestations in the cervix. Usually the process in the cervix has become chronic before infection spreads to the uterine canal, indeed, the internal os often marks the upper boundary of the infectious process.

In very young ill-nourished prostitutes the first gonorrheal infection is likely to be virulent, and to extend rapidly upwards, involving cervix, endometrium, tubes, and peritoneum. Unusual virulence is probably due to diminished local resistance combined with a mixed infection.

As the gonorrheal discharge from the cervix becomes chronic, it becomes more and more mucous and less and less purulent. Therefore when such a discharge begins to show anew the signs of recurring preponderance of pus, one may take this as a sign of infection of the endometrium itself.

With infection of the endometrium of the corpus increased pelvic pain occurs, mingled with pain in the sacral and lumbar regions, a feeling of weight and bearing down, and tenderness of the body of the uterus on pressure. A more pronounced feeling of illness, slight fever, difficulty of bodily motion and locomotion are all symptoms of extension to the canal of the uterus itself.

The acute symptoms usually diminish rather rapidly. This tendency is characteristic of acute manifestation of gonorrhea in all portions of the female genitals. Return of acute symptoms usually indicates extension of the infection to other portions or reinfection of portions which had partly or wholly healed.

The main symptom of *chronic gonorrhea of the endometrium,* both cervical and corporeal, is persistent discharge. Another sign is the presence of *erosions* about the external os. Erosions of the flat epithelial cells of the portio about the os are caused by maceration and

necrosis, with replacement of the squamous cells by cylindrical epithelium from the lining membrane of the cervical canal.

Chronic gonorrheal infection of the *corporeal endometrium* often exists without noticeable symptoms, unless the infection also extends to the mucous membrane of the tubes. In some cases signs of metritis

Fig. 115.—Pyosalpinx prolapsed in rectouterine pouch.

exist; somewhat enlarged uterus, tenderness, exaggerated anteversion, a profuse discharge of watery pus, and different disturbances of menstruation. When the tubes are not involved, the endometrium will rapidly free itself of gonococci. When the tubes are involved, gonococci may exist for years in the discharges of chronic endometritis, even when the discharge is scanty.

Salpingitis

Acute gonorrheal salpingitis usually has a sudden onset, although such infection seldom occurs during the early stages of gonorrhea. When the infection extends to the tubes, there is usually fever, chill, or other symptom of an acute infectious disorder. There is severe abdominal pain and often marked colic, probably due to uterine contractions. Tenderness to a high degree is often the only sign on local examination. With both acute and chronic salpingitis menstruation is usually disturbed. The periods become painful, the flow is increased, and the duration of the flow is lengthened. The interval between periods may become shortened.
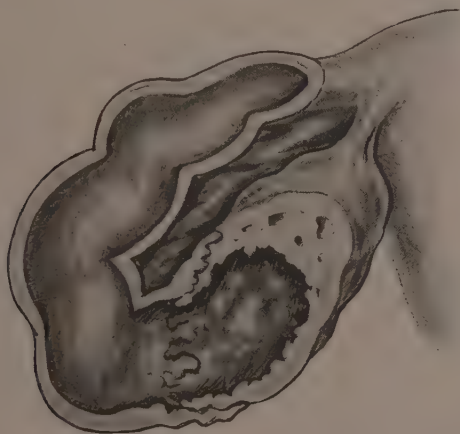
Fig. 116.—Diagram showing formation of tuboovarian abscess.

Chronic Salpingitis.—When the salpingitis does not speedily heal, the chronic manifestations of the infection remain, although the symptoms are less severe than in the acute stages. A general tenderness in the pelvis, especially on one side, a feeling of weight and discomfort in the pelvis and lower abdomen, menstrual disturbances, poor general health, loss of weight, pallor, poor complexion, anorexia, and constipation are conditions usually present with chronic salpingitis. The general symptoms resemble those of chronic infection in other parts of the body, such as the tonsils, the alveolar processes and the roots of the teeth, the nasal cavities and sinuses.

Local manifestations point to the diagnosis. Often both coitus and

defecation are painful, because of pressure on the thickened and tender tubes.

Bimanual examination usually reveals a mass behind the uterus and extending to one or both sides, more or less adherent to the uterus, tender, and irregular in shape and consistency. Sometimes a tubal abscess or a hydrosalpinx will be so definite in contour as to be recognized as a fluctuating cystic tumor, situated to one side of the pelvis. Usually the coexistent pelvic peritonitis will have caused so much adhesion of all peritoneal surfaces that the resulting mass, containing tubes, ovaries, omentum, and other organs, will be indefinite in shape and extent, irregular in outline, and varying in consistency.

OOPHORITIS AND PELVIC PERITONITIS

Gonorrhea of the ovaries is so intimately related to gonorrhea of the peritoneum that both must be considered together. Gonococcal pus has been found in the follicles of the ovary at operation, due to infection from the peritoneum or from the pus out of the tubal ostium. Pain is a factor, but is not distinguishable from that due to infection of the tubes or of the pelvic peritoneum alone. Indeed, all these structures are usually involved together. General peritonitis of purely gonorrheal origin is seldom or never observed. The tendency towards formation of adhesions prevents rapid extension along the surface of the peritoneum.

Involvement of the pelvic peritoneum in the gonorrheal infection is not infrequently the result of traumatism incident to labor or abortion. Some of the milder forms of puerperal fever owe their origin to a more or less latent gonorrhea of the tubes which is called to life by the diminished resistance, trauma and increased pabulum incident to childbed.

Secondary Results of Gonorrhea

The clinical course of gonorrhea varies widely in different cases. Probably there is a difference in the virulence of different strains of the gonococcus. There is a greater resistance in some patients than in others. In some instances the difference seems to depend upon the part or parts of the genital tract infected. As the infection extends beyond the internal os uteri, the symptoms become more severe and the permanent damage is greater than when confined to parts lower down in the tract. It is probable that the soil is more favorable.

Extension is favored by menstruation, which offers auspicious opportunities for the cocci. The puerperium also offers a favorable factor, in that there is an abundance of culture medium in the discharge, a weakened general and local resistance, and also a wide opening between the cervix and the cavity of the corpus uteri.

Sterility is a frequent consequence of gonorrhea in the female but by no means is it a necessary consequence. In all women infected with gonorrhea conception and the birth of healthy children is possible. However, in many even a healed gonorrhea leaves a genital canal so changed by adhesions, occlusions, or cicatrices that childbirth is rendered unlikely. The abnormal discharge may be unfavorable to the spermatozoa.

In no individual case, no matter how severe and no matter what organs have been affected, can one state positively that conception and child-bearing are impossible. Often sterility may exist for years after the acute attack, although no signs of the continued existence of the disease are manifested, and at last the woman may conceive and even bear a healthy infant.

In the presence of gonorrheal endometritis, the spermatozoon may reach the ovum and impregnate it, but the impregnated ovum may find no suitable place within the endometrium for its embedding. Even if it does become embedded, the diseased decidua will often prevent continued growth and nutrition of the embryo so that abortion will result.

Ectopic Gestation.—A tube diseased or deformed from a previous attack of gonorrheal salpingitis may recover enough to allow impregnation of the ovum, but the ovum may be arrested in its passage through the tube by adhesions or because of blind pockets due to adhesion of parts of the folds of its mucous membrane. The ovum may pass so slowly that it grows too large to go through the whole length of the tube. In such cases the ovum may embed itself in the mucous membrane of the tube and cause tubal extrauterine pregnancy.

Gonorrheal Arthritis.—So-called gonorrheal rheumatism is characterized by pain, swelling, and tenderness in and near a joint, usually a large one. The disturbance is more common in the male than in the female. There is seldom much fever and no sweating as in true rheumatism. The affection is generally limited to a few joints, although sometimes aponeurotic structures may become in-

volved.   Rarely there is a gonorrheal endocarditis.   Frequently there
is accumulation of fluid within the joint cavity.

Prognosis

The *prognosis of acute gonorrhea* of the urethra and cervix is gen-
erally favorable.   Complete recovery usually ensues under treatment,
or often without treatment.   The same is true of vulvovaginitis of
infants and children.   When the infection involves the periurethral
and vulvovaginal glands, the customary treatment is usually to be
relied upon to effect a cure with reasonable certainty.

Unfavorable points in acute gonorrhea are quick extension up-
wards to the tubes and peritoneum; inimical circumstances, such as
excessive exertion, excessive coitus, both especially at the menstrual
periods; continued sexual relations with a male still uncured of a
chronic gonorrhea; the puerperium; general diseases of a weakening
character.

The *prognosis of chronic gonorrhea* of the endocervix and endo-
metrium, when there is little diminution in the number of the gono-
cocci in the discharge, is doubtful as to ultimate healing.   Favorable
points in such cases are rapid diminution of the discharge with de-
crease in the number of the gonococci, cessation of the pain and ten-
derness, normal phenomena at the menstrual periods.

When the tubes are attacked, the prognosis as to complete recovery
is much worse than when the infection is elsewhere.   Yet even exten-
sive suppuration of the tubes and matting together of pelvic struc-
tures by adhesions may symptomatically recover under careful and
persistent treatment without operation.

Chronic gonorrhea diminishes the *chances of conception and child-
bearing* in equal measure with the duration and severity of the dis-
ease.   When the tubes have been infected, the chances of normal
pregnancy are very much reduced.   They are practically *nil* when
both tubes have become pus sacs and when the pelvic organs have be-
come glued together into an adherent mass.   It must not be forgot-
ten that sterility in marriage is, in at least fifteen per cent of the in-
stances, due to the husband.   A double epididymitis almost always
renders the man sterile from absence of spermatozoa, or because of
lack of vitality of his spermatozoa.

One-child sterility is a term applied to cases in which women bear
once and never again.   In most instances the cause is gonorrheal in-

fection which has been extended to the uterine and tubal mucosas by reason of the puerperal state and has consequently closed the tubal lumina by adhesive inflammation.

Gonorrhea rarely causes direct *danger to the life* of the woman. Pyelitis, nephritis, rupture of pus tubes, and such accidents are usually caused by mixed infection with septic microbes. The chronic invalidism incident to chronic uterine, tubal, or peritoneal infection by the gonococcus may increase the susceptibility to other infections, and may, therefore, frequently contribute indirectly to the ultimate cause of death.

Recovery.—It is often highly desirable to be able to determine when the patient has recovered from gonorrhea. Absolute certainty can not be obtained by any methods at present known. Even reasonable assurance of safety is difficult to determine. In infection of the tubes and peritoneum one can be certain only after a complete successful operation. In endometritis and endocervicitis, a considerable number of smears must be examined over a prolonged period.

The cervical canal will be infected as long as that of the uterus itself, although the reverse is not always true. Therefore, if we can only make up our minds that there is no longer infection in the cervix, we can be reasonably sure that there is none in the uterus. A bivalve or tubular speculum is passed to the vault of the vagina, exposing the portio and external os. A sterile loop or swab wipes some of the discharge from the os and this is smeared over a sterile glass slide. After drying and staining, the specimen is microscopically examined for the gonococcus. One negative examination is of small value but the more the examinations are multiplied, the greater their negative value.

Smears should be taken before, after, and even during the menstrual flow. The patient should always be instructed not to take a douche for at least twenty-four hours previous to the examination. Similar smears should be made from the vulva and from the strippings of the urethra. Such careful microscopic examinations, made once or twice a week for six or eight weeks or longer, are about the best means we now possess for determining whether gonorrhea has recovered.

Serum tests, vaccine tests, and the complement fixation test are corroborative, but have not the practical value which the earlier investigators would have us believe.

Treatment

Prophylaxis

Prophylaxis of gonorrhea is both a *sociological and a gynecological problem.* Abolition of prostitution would probably greatly diminish the extent of the disease, but could not stamp it out altogether. Because prostitution has existed since the dawn of history and shows no relative decrease in spite of all sorts of efforts to restrain or abolish it, be they educational, legislative, or religious, it is probable that it will exist as long as man exists.

Personal *prophylaxis on the part of the man* has served to a considerable degree to diminish the prevalence of gonorrhea in armies and navies. If it could be carefully carried out, it would probably do the same in civil life. This presents the question of discipline and compulsion. In the military services both are at a maximum. In civil life in English-speaking countries the procedures necessary to enforce personal prophylaxis would not be endured.

In the *United States Army*, gonorrhea, syphilis, and other venereal disorders have been very much reduced and disability on their account brought to a minimum by the method at present in force.

General Order No. 17, of 1912, is the authority. Every two weeks each enlisted man is inspected for signs of venereal disease. If any appear, he is kept restricted to the post and under treatment until manifestations have disappeared. In cases of gonorrhea there must be several negative smears. The man's pay stops during the period while he is incapacitated from duty on account of the disease. On return from leave, the man must report to the venereal room or tent if he has been exposed to the chances of venereal infection. This venereal room is open and in charge of a hospital corps man day and night. If the returning man fails to report and is later found to have venereal disease, he will be tried by a court-martial and punished.

The exposed man, reporting to the venereal room, is given the *venereal prophylaxis* which consists of the following: The penis is thoroughly washed with soap and water, then with a solution of bichloride 1-5000; 4 c.c. of protargol 2 per cent solution, or the same of nitrate of silver is injected into the anterior urethra and held for three minutes; the whole penis, glans, prepuce, and shaft, is then smeared with an ointment containing 30 per cent calomel in lard.

The results have been very encouraging, having diminished the non-effective rate from these diseases from one-half to two-thirds. Variations depend upon the thoroughness of individual medical officers.

Personal cleanliness on the part of the woman, especially after suspicious coitus, to the extent of using copious antiseptic douches directly afterwards would reduce her chances of acquiring gonorrhea. Persons affected with genital gonorrhea should be careful to wash the hands after touching the genitals for any purpose; should destroy any cotton or gauze used; and should see that the clothing which might have become infected has been sterilized or thoroughly dried before allowing it to go to the wash. The danger of infecting the conjunctiva of oneself or others should not be forgotten.

Marriage to men infected with gonorrhea in either the apparent or latent form is probably the chief cause of the disease in women. No man should marry who has ever had gonorrhea until it has been found on careful examination that he is free from it. Repeated microscopical examinations of smears from the urethral discharge, running over several weeks or even months and always negative, should be the only reason for allowing marriage.

The minute urethral threads, which are usually found in the urine of men who have had gonorrhea, should be examined under the microscope for pus corpuscles and for gonococci. If no leucocytes are found, it is very unusual for gonococci to be found. One or even several examinations should not suffice. The period of the examinations should stretch over several weeks so as to cover various aspects of physical condition—resting, exertion, excesses in eating and drinking, and other activities.

TREATMENT OF ACUTE STAGES

Treatment of acute gonorrhea in woman resolves itself first into prevention of all accidents which favor an extension of the infection. Practically in all cases acute infection by the gonococcus is limited to the urethra, cervix, and vulva, although extension of the infection to other parts of the genital tract is marked by acute exacerbations.

A prominent factor which hinders healing and favors extension of the infection is continuation of sexual relations with a chronically infected man. New carriers of infection are thereby continually deposited within the genitals of the woman, and the inflammatory proc-

ess is started anew. Extension is also aided by the traumatism and the hyperemia. Coitus must therefore be forbidden until the man's gonorrhea is cured. Rest from all exertion is often essential, even rest in bed.

Local treatment during the acute stages is not indicated. There is no known means of aborting gonorrhea after the diagnosis has been made. Use of the sound and all local applications to cervix and uterus do more harm than good. Less harmful, but hardly more helpful, are antiseptics per vagina. Cleanliness by means of external douching of the outer genitals, perhaps with antiseptic solutions, is all the local treatment usually recommended by the best authorities.

Many textbooks, however, advise *attempts to abort* the disease by painting the vulva and vagina with strong solutions of silver nitrate, potassium permanganate, or iodine. Except during the first few hours after the infection, such methods are of questionable utility. The temptation to try heroic measures is sometimes hard to resist, so much has the public been educated to expect impossibilities by advertisements of sure-cure remedies, and by quack practitioners.

Eczema of the skin about the external genitals should be forestalled by the use of ointments of animal fats. Douching of the urethra and vulva is best accomplished by diuretics which cause a free and frequent evacuation of a bland urine. Benzoate of sodium or hexamethyline, with large draughts of pure water, render the urine antiseptic.

Treatment of Chronic Stages

In the subacute and chronic stages, when the danger of extension of the infection by *local treatment* is diminished, it is permissible to begin such measures. The time for this will be a few weeks after the beginning of the disease, and will be indicated by diminution of the hyperemia, change of the discharge from the thick yellowish creamy appearance of the acute stage to a thinner slimy milky secretion.

Successful handling of subacute and chronic cases requires a careful knowledge of localization of the infectious process and a *microscopical control* of the results aimed at. Some discharge is normal in married women, and one can never tell when the gonorrhea is healed unless he makes frequent microscopical examinations.

At this stage *applications may be made to the vulva* of two per cent solutions of silver nitrate or higher percentages of the albumin-

ous silver salts, ten per cent solutions of ichthyol, and, for the urethra, weaker solutions of the same drugs. Four per cent solutions of methylene blue often give good results. Eroded or ulcerated places must be cauterized by silver nitrate stick, by actual cautery or by fortified tincture of iodine.

It must be remembered that cure takes place under any of these measures only because the drugs act upon the microbes within the superficial cells and between these cells, and by stimulating the exudation of leucocytes which will absorb the deeper situated microbes and bring them to the surface. We must always depend upon the natural reaction of the infected tissues. Without this help, full regeneration is impossible.

The *urethra may be syringed* with solutions of silver nitrate from one per cent to one per mille, ichthyol ten per cent, or protargol two per cent. The danger of driving infectious matter up into the bladder is small if one is careful not to allow any considerable pressure in the urethra.

The *action of the balsams* by mouth is not well understood, although empirically they often seem to hasten recovery from gonorrheal urethritis. Certain it is that they have little influence upon the gonococci, although they may allay irritation.

In gonorrhea of the **vulvar and vaginal mucous membrane** silver nitrate one to ten per cent solution (in children by catheter and in adults by swabbing or injection) is a sovereign remedy. A douche or irrigation with salt solution should immediately follow. The infected vulvar follicles must be sought out singly and touched with lunar caustic stick or galvanocautery. The vulvovaginal glands may sometimes be injected with silver solutions through a fine syringe, or must be opened and drained.

Uterus.—The *cervical canal* may be slightly dilated mechanically, and treated by swabs soaked in silver-salt solutions, or in ichthyol. Ichthyol solutions may be applied to the os and thence soak into the cervical canal by means of tampons. It is rarely safe to employ local applications to the *canal of the uterine body* because of the danger of traumatism and of carrying infection into the tubes.

Daily or twice daily copious hot douches should be used. Every day, or second day, tampons of lamb's wool soaked in ten per cent ichthyol in glycerine should be inserted. Drainage of the uterus is thus favored by osmosis and some of the ichthyolated glycerine

from the tampons reaches the uterine canal. The hot douches supply heat and moisture, which stimulate hyperemia and local leucocytosis.

Curettage should be employed only in cases where metrorrhagia indicates a hyperplasia of the glandular structures of the endometrium, after the gonococci have disappeared. Much of the benefit of curettage probably arises from the preliminary dilatation and consequent drainage. It is certain that no scraping of the uterine mucosa can be so complete that all infectious matter is removed. It is also certain that new areas are opened by the curette for infection from the microbes which remain.

In rare cases and with extreme caution against permitting pressure within the uterine cavity, *injections* of antiseptic solutions through the uterine syringe may be employed.

Treatment of Salpingitis

Acute gonorrheal infection of the tubes is not properly treated by operative measures. Rest in bed is essential as long as there is any marked pain or tenderness. Hot applications to the abdomen, colonic flushings, and hot vaginal douches may be used. General measures and diet should follow the febrile indications. Hot vaginal douches and ichthyolated glycerine tamponade should be continued for many weeks after the patient gets up and goes about.

Chronic salpingitis and pyosalpinx, especially when associated as generally with peritoneal involvement and with extensive adhesions, is *best treated by operation.* This operation consists in removing the hopelessly damaged tubes and such parts of the ovaries as are hopelessly involved, and in breaking up the adhesions and covering the raw places with a coating of peritoneum derived from the omentum or elsewhere. In some cases the uterus is so badly infected that it must also be removed, but generally it is unnecessary to do more than thoroughly dilate its canal and curette. This last is falling into disuse among the most progressive operators.

Gonorrhea During Pregnancy and Puerperium

Gonorrhea during pregnancy can not safely be treated by any measures more vigorous than cleanliness and vaginal douches. Abscesses of the vulvovaginal glands must be incised. Chronic urethritis, if it exists, must be treated by the measures already advised.

During the puerperium of women infected with the gonococcus, it

is dangerous to use douches or injections into the internal genitals
for fear of extending the infection upwards. Such a patient should
lie in bed several weeks longer than the normal puerperal woman,
until the uterus and genitals have undergone a good share of the
necessary involution. Extension of gonorrheal infection to the tubes
is especially likely to occur during the puerperal period.

SERUM AND VACCINE

Antigonococcic serum has been employed to some extent in gonor-
rhea of the female and of the male, but appears deservedly to have
diminished in favor. The serum is prepared in the biological labora-
tories of the large pharmacal houses, and is furnished in sealed glass
ampules for hypodermic administration. The best success has been
attained in cases of gonorrheal arthritis.

Of late, the *vaccine treatment,* that is, subcutaneous injection of
sterile solutions of dead gonococci has given better promise. *In acute
cases* small doses, say of from one to ten million cocci, at intervals
of from two to three days, are considered of more value than larger
doses, say of from fifty to one hundred million, at greater intervals.

In chronic cases the vaccine is only indicated when the gonococcus
is still an active agent, and then in doses of one or two millions every
three to five days, or five to seven millions every five to seven days.
Larger doses are not valuable in the chronic stages of the disease.

The vaccine seems to work better in cavities closed to the outside
world, such as the tubes, peritoneum, uterine cavity, and joints, than
in those more freely open, such as the cervix, urethra, and the vulvar
glands. The best results are obtained in gonorrheal arthritis. The
pain and swelling often diminish rapidly under the influence of the
injections, and ultimate recovery is usually effected. The dead bac-
teria are on the market in sealed tubes or ampules in sterile normal
salt solution and marked with the dosage in number of millions of
bacteria. Autogenous vaccines are often of more value than stock
varieties.

LACTIC ACID

Acting upon the hint given by the normal contents of the vagina
in health, namely, the presence of lactic acid and lactic acid pro-
ducing bacilli, some authors have recommended solutions of lactic
acid containing the bacilli in the treatment of gonorrhea and other

infections of the female genital tract. Good results are reported from the use of a solution containing these bacilli given by vaginal injection or soaked into tampons.

The discharge rapidly diminishes and becomes less and less purulent. Even the discharges from cervix and uterus become less purulent. Many complete cures are reported. Some use sour milk from which the casein has been removed by filtration and others the cultures of lactic acid bacilli furnished in tubes or in tablet form. The genital tract is first douched with an antiseptic solution, the solution is removed by gauze or cotton, and then the lactic acid solution is introduced, either by injection or upon tampons.

CHAPTER XII

PYOGENIC INFECTION

The term *septic,* meaning decayed or poisonous, would apply broadly to every kind of infection, but has come to be limited in pathology to infection by the microbes which are capable of causing the production of true pus, the so-called pyogenic bacteria.

The *distinction between septic and saprophytic* organisms is that the former exist within the living tissues and take nourishment from the tissues themselves. The latter take their nourishment from material no longer a part of the tissues or never a part of them, usually dead material. In other words the septic microbes are parasites while the saprophytes are tenants of the body of their host, living upon his excretions.

Parasites are of two kinds, facultative and obligate. The *facultative parasite* can live upon the tissues of the host or can live upon other culture media. Types of such facultative parasites are the pyogenic streptococci and staphylococci. They live all around us and are found on almost everything, but, when they get within the tissues of the body, they become parasitic and cause various degrees of septic infection. Indeed, they may live upon dead matter, such as blood, serum, or necrotic material, inside the cavities of the body, but not within the tissues themselves, and do little or no harm to the body. Thus the facultative parasites may be either septic or saprophytic.

The *obligate parasite* can live only upon the living tissues or only poorly upon other matter. Types of the obligate parasitic microbes are the spirochete of syphilis, the tubercle bacillus, and the gonococcus. The obligate parasitic microbes are seldom saprophytic.

In some cavities of the body *saprophytic microorganisms* of certain varieties are *normal tenants.* Such are the proteus vulgaris, the colon bacillus, and other putrefactive microbes in the alimentary canal; the multitudinous bacteria within the mouth and nasal cavities; and the lactic acid bacilli within the vagina.

In the alimentary canal from lips to anus, the various pyogenic microbes are always numerous, but living as saprophytes. When, through traumatism, intestinal stasis, or other accidental cause, the pyogenic microbes gain access to the tissues themselves, these microbes become parasitic and septic. That common denizen of the intestinal canal, the bacillus coli communis, is a striking example of a harmless and useful microbe which, under certain circumstances, can become a septic parasite, invading the tissues, causing untold local and general disturbances, or even the death of the host.

Forms of Pyogenic Infection

In septic infection, the microbes are within the tissues, in the cells, in the leucocytes, and in the intercellular spaces. They may also be within the lymph and blood channels and thence may be carried to distant parts of the body. In the latter case, the condition is known as bacteriemia.

The term *septicemia* is one which is used rather loosely in pathology. Strictly speaking, septicemia should mean the presence in the blood of septic matter derived from the toxins formed as a result of the growth of septic microbes within the tissues. By many authors, however, the term is made to include bacteriemia.

When the microbes are carried through the blood stream in company with emboli, the condition is known as *pyemia*. In pyemia the little embolus, infected with the microbes, is carried to some terminal arteriole where it becomes lodged and forms an abscess. The formation of multiple abscesses in different parts of the body is characteristic of pyemia.

Toxemia is a term sometimes used to indicate the condition which we have called septicemia. It should, however, have a broader meaning to include other poisons, such as uremic, eclamptic, etc.

Our knowledge of septic processes and of infection has been enriched greatly in the last few years by the labors of numerous investigators. Much that had formerly been accepted as settled has again become debatable or has been proved untenable in the light of recent research. Our conception of septicemia, sapremia, and all the phenomena of infection has been altered. We can no longer speak with such dogmatic certainty concerning the limitations of these terms.

From symptoms and physical signs alone it is impossible to dif-

ferentiate between localized infection and the presence of bacteria in the blood stream. In cases of apparently insignificant localized infections, without fever, high pulse, increased blood pressure, or other generalized symptoms, microscopical examination and bacteriological examination of the blood will frequently find it infested with microbes like those in the local lesion. Even when the bacteria in the local infected area are of the varieties usually supposed to be saprophytic, they still may be discovered in the blood.

Since these microbes floating in the blood sometimes appear to cause no general symptoms, it is evident that they may be harmless there. It is probable that, in the living blood, these microorganisms do not proliferate extensively and that they quickly die. They may, however, become lodged in some other locality where the vital processes are less perfect, some *locus minoris resistentiæ,* and set up infection there. When they are found in the blood in great numbers and are evidently proliferating, the prognosis is rendered very bad because of the extensive general poisoning of the body by toxins excreted by the microbes. This condition would be the true bacteriemia.

Pyogenic infection or *surgical sepsis* is the same pathological process, whether it affects the female genitals, the peritoneum, the lymphatics, the bones, the joints, the nervous system, or any other tissue of the body. Gynecologically, obstetrically, or surgically, sepsis is the same thing except as modified by the peculiar anatomical and histological characteristics of the individual tissue.

The differences in extent, virulence and character of the infection depend upon the *susceptibility* of the tissue or of the individual; the species of the microbe, or even the peculiar strain of that species; the *resistance* of the tissue, and the general resistance of the body. Probably something also depends upon the number of microbes introduced at the same time—the *dosage.* The tissues, aided by the leucocytes, can take care of a limited number of even virulent microorganisms but are overwhelmed by the simultaneous invasion of a large number.

Etiology and Pathology

The *specific cause of pyogenic infection* is not one particular microbe like the gonococcus, but any of several species of pus-producing bacteria. The most important group of these bacteria is that of the streptococci. All streptococci, even those which look alike under

the microscope, are by no means of the same variety. Indeed, under changing food supply, and differences in heat, moisture, etc., the varieties seem to change very much from the original. Virulence, the property of liquefying certain culture media, staining properties, and numerous other characteristics of the original strain will change under different forms of environment.

The *commoner bacteria* which produce pus are, first and foremost, the streptococcus pyogenes, then the pyogenic staphylococci, (albus, aureus, and citreus) the bacillus pyocyaneus, and the bacillus coli communis. The *streptococci* always divide in the same plane so that the new individual micrococci, as they adhere to each other, form chains; hence the name. The *staphylococci* divide in various planes, so that their development is in the form of bunches of grapes; hence the name. The *bacilli* divide in the transverse plane and sometimes form chains if the new individuals adhere.

All of the common pyogenic microbes take the commoner *aniline stains,* usually much more strongly than the nuclei of the tissue cells, so that the microorganisms are plainly marked in stained specimens. Most of them grow well on the common culture media and are *facultative parasites.* Apparently they can maintain existence upon dead material as well as upon the living tissues. To a considerable extent they resist drying and variations in temperature.

The streptococci especially are ubiquitous. They are found upon the skin, within the buccal and nasal cavities, in the hair, on the clothing, and upon all objects used by mankind. They are denizens of the mouths of the sweat and sebaceous glands, of the anus, of the alimentary canal, of the vulva, and sometimes of the vagina. They are usually harmless tenants and messmates of their host, living upon his surplus and his waste. They are ready, however, to enter and to live upon the vital tissues whenever injury or localized lowering of vitality from other cause breaks down the barrier.

The *commonest mode of entry,* from the gynecological standpoint, of the septic microbes into the tissues is through the changes incident to abortion, labor, or the puerperium. Probably half of the cases which present themselves to the gynecologist for diagnosis and treatment are due to gonorrheal infection. Probably nine-tenths of the remainder are due to infection by the pyogenic microbes introduced into the woman's body because of the accidents incident to child-bear-
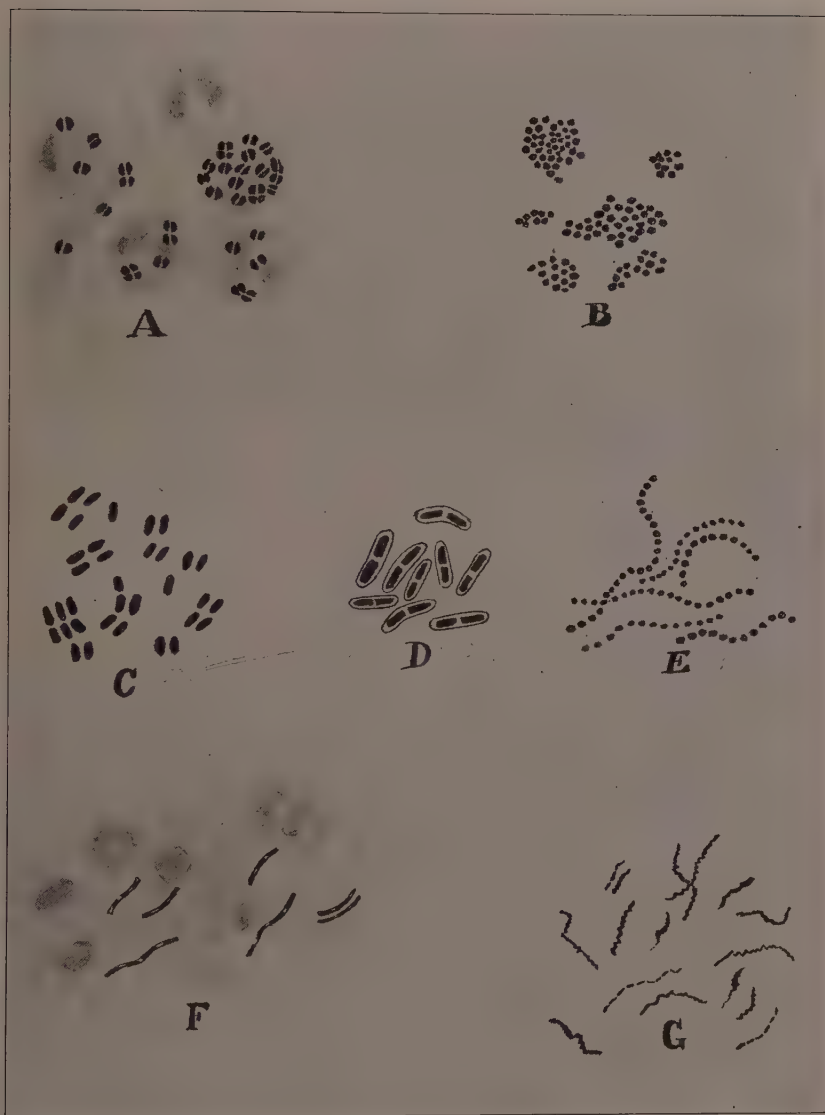
Fig. 117.—Pathogenic bacteria found in the genital canal. A, gonococcus; B, staphylococcus; C, B. coli communis; D, B. aerogenes capsulatus; E, streptococcus; F, B. tuberculosis; G, spirocheta pallida.

ing. Other sources of infection are coitus, menstruation, the examining finger, instruments, and migration from the alimentary tract.

Mixed Infection.—Septic infection is not usually the result of inoculation with a single variety of germ. Except in the severe cases of general peritonitis or of general bacteriemia, it is rare to find a pure culture. One variety, usually a streptococcus, is predominant, but others will also be found, such as staphylococci, nonpathogenic microbes, and frequently saprophytic bacilli.

When the infection gains entrance to the tissues of a part, the irritation of the toxins excreted by the microbes causes dilatation of the local blood vessels; *local hyperemia*. From these dilated vessels there exude into the connective tissue spaces the fluid contents of blood, accompanied by many leucocytes. The latter are to become the phagocytes whose function will be to absorb and destroy as many microbes as possible.

With the hyperemia, the increased blood supply causes increased secretion of any glandular structures which may be situated in the region affected. Therefore there will be an excess of mucus, sebum, or other glandular secretion. When the hyperemia becomes greater, the pressure of the dilated vessels and the exuded lymph causes a local stasis and may diminish the secretion of the glands.

Inflammation.—The toxins of the invading microbes, absorbed by the lymph vessels and the venules, are carried into the circulation. General fever of greater or less intensity ensues, following the localized warmth due to the hyperemia. The pressure of the dilated vessels and the edema within the confined lymph spaces causes pain in the terminal nerves of the region. The increase of blood has already caused a local redness. Thus we have the *cardinal clinical factors* of inflammation; pain, heat, redness, and swelling. This much is the *local reaction*.

The heightened bodily temperature and the other symptoms of fever are the signs of the *general reaction*. The number of leucocytes in the blood increases according to the severity of the septic invasion, and according to the reaction of the tissues and of the body generally. Antibodies are formed to neutralize the poison elaborated by the microbes, and the whole complicated process of *immunity* is set in action.

The leucocytes are most numerous at the margin of the infected area where they attack the advancing microbes, which are growing in the morbid tissues. The large number of leucocytes and the exuded lymph

tend to block the return circulation from the infected locality and to *wall off the infectious process.* The tissues in the center of the area become more or less necrotic, the intercellular spaces fill up with blood fluids mixed with dead and dying leucocytes and with dead and living microbes.

An incipient *abscess* is in process of formation. At the margin, the toxins and some of the bacteria are taken up by the lymph channels and carried to the lymph glands draining the region. Often, therefore, the regional lymph glands become enlarged, tender, and painful. This invasion of the lymph glands, however, is an additional safeguard against the eruption of toxins and microbes into the general circulation.

Bacteriemia.—Sometimes the invading bacteria are taken up by the lymph channels or even by the venules and thence indirectly or directly reach the blood stream. In general it is believed that such an incursion of microbes into the blood itself denotes a more severe condition, either because of the greater virulence of the microbes, or the lessened resistance of the organism. In a fair proportion of cases, however, bacteria are detected in the blood stream, although the patient is suffering from a clinically mild disorder or, indeed, shows none of the bodily signs of infection. Therefore, in an individual case, the clinical value of the presence of infective bacteria in the blood stream is not so great as was recently suspected.

Infection of the Uterus—Endometritis—Metritis

Pyogenic infection of the uterus is the most important division of the subject of infection of the female genitals. It is best studied as a whole, rather than as divided into infection of the different parts and structures of the uterus. The usual avenue of infection is by way of the external world from the vagina. It may enter by way of the blood from some focus elsewhere in the body. Occasionally it will enter the uterus by way of the tubes from the peritoneum.

Endometritis, or infection of the uterine mucosa, is rarely found alone, but is practically always accompanied by **metritis,** or infection of the musculature and lymph spaces of the uterine wall. The uterine cavity opens into that of the vagina and the vagina through the vulva opens into the outer world. There is an easy avenue for germs to enter the uterus from without. This entrance is likely to be effected

when there is a supply of nutriment for the germs in the vagina and uterus, such as there is after labor and abortion, and during the menstrual flow. If, in addition, the uterine mucous membrane has undergone some traumatism, as is the case postpartum and postabortum, the chances of infection of the organ are increased.

Infection upwards by way of the vagina is prevented normally by the closure of the vulvovaginal opening, the external os, and the internal os, as well as by the bactericidal action of the secretions within the vagina. According to Doederlein and Williams, the vaginal contents are rendered nonpathogenic by the action of benign bacilli which grow within the vaginal cavity. The cervix is normally free from any microbes, pathogenic or nonpathogenic.

Certain it is, however, that the whole genital tract as far upwards as the internal os uteri is infected in every case within a few days after labor or after abortion. Of course the infective microbes usually are merely tenants of the genital canal and cause no symptoms. It must always be remembered that there is a *potentiality of infection present in every puerperium* in spite of every effort at asepsis.

The *source of the microbes* which occupy the normal puerperal and postabortive genital canal is three-fold. First, they may come from the *germs always present* in the vulva. In spite of every effort, it is impossible to render the vulva absolutely aseptic. Second, these microorganisms may come from the *rectum* by way of the feculent gases passing through the anus so close to the vulvar opening. Third, they may come on account of *digital examinations* made during labor, either because the fingers are themselves not entirely aseptic (as ungloved fingers never can be) or because they push upwards infectious material which was already present in the vulva or lower portions of the vagina.

Protection.—During the few days while the genital canal is still free from germs, the healing processes have an opportunity of closing lymphatic and vascular avenues of infection at the sites of the inevitable injuries along the parturient tract. Thus it follows that pathological processes are not more frequent after labors and abortions, provided there have been the minimum of traumatism and meddling, and the maximum of efforts at asepsis. It also follows that one should make no examinations and introduce nothing into the vagina during the puerperium, except for sufficient indications.

Other causes of septic infection of the female in or by way of the genital organs, aside from the sequelæ of pregnancy, are relatively very rare. Coitus and other normal conditions of life may cause the introduction of infective matter, but, unless some injury has been sustained, infection will not follow. Even during the menstrual flow, although the soil is prepared and other conditions may be favorable, the absence of traumatism usually precludes infection. There is always, however, a danger from intrauterine instrumentation, either operative or diagnostic.

Pathologically, two varieties of endometritis can be distinguished, *glandular and interstitial*. As the names imply, these varieties depend upon whether the major part of the pathological process affects the glandular or the interstitial structure of the endometrium.

ACUTE ENDOMETRITIS

In the acute form, both portions of the endometrium are involved, and, indeed, the muscular portion of the uterus as well. The microbe concerned in acute septic endometritis is generally some form of streptococcus, sometimes a staphylococcus. There is more or less necrosis of the superficial layers of the mucous membrane, depending upon the severity of the infection. There is exfoliation of epithelium, exudation of serum, pus, and even blood. Sometimes the necrotic surface of the membrane remains for a time attached to the deeper portions, giving the appearance often known as *diphtheritic endometritis*. True diphtheria of the endometrium is very rare.

The *mucous membrane is congested and swollen* with exudation, the vessels of the whole organ are distended, the epithelium is wanting in places and is replaced by granulation tissue. The glands are hyperplastic and contain microbes. The whole tissue of the endometrium abounds in round cells. The lymphatics are often filled with bacteria which set up infectious processes in the musculature (*metritis*), on the peritoneal surface (*perimetritis*), in the connective tissue spaces within the broad ligaments (*parametritis*), in the pelvic lymphatic glands, or even by metastasis in distant parts of the body.

Involvement of the uterine veins in the infection may lead to *thrombophlebitis* of the veins of the broad ligament and the pampiniform plexus, with possible extension to the iliac and femoral veins. Extension by continuity of mucous surfaces may carry the infection

to the tubes (*salpingitis*). The tubes may become infected by way of the peritoneum or by way of the lymphatics. Localized collections of leucocytes may give rise to abscesses in the muscular layers or in the areolar spaces between the layers of the broad ligament.

Acute saprophytic endometritis often can not be distinguished from acute septic endometritis. Indeed it is so distinguished chiefly because of the varieties of microbes found in the discharges, namely, the putrefactive saprophytic microbes. *Clinically* the symptoms are usually less severe than in those cases where the chief microbic tenant is some streptococcus; the discharges are more likely to be foul-smelling; extension into near and remote tissues is less likely to occur,
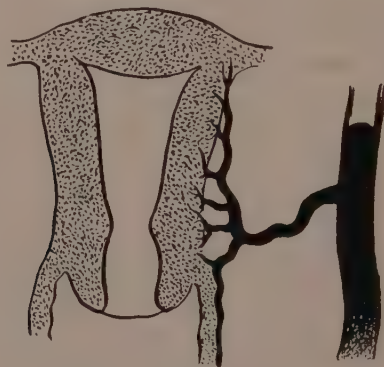

Fig. 118.—Diagram of extension of thrombophlebitis.

and removal of the decomposing contents of the uterus usually results in quick improvement.

Practically speaking, it is uncommon to find discharges in so-called saprophytic endometritis which do not also contain streptococci. These streptococci may be saprophytic, living upon the pabulum furnished by the dead animal material in the uterine canal. They may be wholly or in part parasitic, living upon the tissues of the endometrium itself.

During the puerperium, or during the period after an abortion, the uterine cavity is most likely to contain dead animal material, namely, retained secundines or clots of blood. These retained matters become infected from below or from hands and instruments. Putrefaction results if the main factors in the infection were saprophytes.

If the main factors were streptococci, or other so-called septic microbes, these may live as saprophytes without producing any putrefaction and consequently no foul odor, but the products of such bacterial metabolism (toxins) may be absorbed by the tissues and cause febrile symptoms. So also may the products of bacterial metabolism of the putrefactive microbes be absorbed and cause symptoms, but less commonly and usually less severely.

Absorption of the microbes themselves into the body by way of the lymph or blood channels may indeed occur in both instances, but is extremely more probable with streptococci and staphylococci. Even when so absorbed, the microbes may or may not cause severe symptoms or even any symptoms at all. Therefore the clinical evidence from bacterial cultures of the discharges and of the blood lacks much of crucial value in gynecological infections. In individual cases—and individual cases are what we have to meet—the frequent exceptions to general rules much reduce the value of the rules.

A saprophytic infection of the contents of the uterus (perhaps it should not be called a saprophytic endometritis) may result from other causes than the retention of products of conception, although relatively seldom. Such may be the decomposing necrotic shreds of a carcinoma, fibromyoma, or other uterine tumor. Necrotic portions of the endometrium caused by injury from foreign bodies, instrumental interference, or escharotics may serve as the culture media for microbes entering from below.

Chronic Endometritis

The interstitial tissue, in acute endometritis, as well as the glandular structures, is involved in the pathological process. This is especially true of the septic forms of infection; less of the saprophytic forms.

In the healing of such a process *cicatrization* occurs, as everywhere else in the body. The acute process has already caused a marked thickening of the whole endometrium due to the exudation of lymph and leucocytes. This results in a chronic form of hypertrophy of the connective tissue of the endometrium with increase of the round cells and of the fibrous tissue supporting them.

As *cicatricial contraction* takes place, the endometrium indeed becomes thinner, but not enough to overcome the original hypertrophy. The uterine glands, compressed by the surrounding connective tissue, often become atrophic.

Therefore, the microscopical picture of a *chronic interstitial endo-metritis* is that of an increase in the connective tissue portion and a diminution of the glandular portion. The atrophic changes of old age resemble this condition except that both elements of the uterine mucous membrane, glandular and interstitial, are diminished.

This form of atrophy is sometimes considered under the head of *senile endometritis*. Besides the decrease in number and size of the glands in most of the forms of atrophy, which are sometimes erroneously styled atrophic endometritis, the epithelium of the glands and of the surface of the mucous membrane takes on atrophic changes. The cells become reduced in the long diameter and take on a cuboidal shape, sometimes flattened and even, and in rare instances, a squamous appearance. In these extreme conditions, the glands are much atrophied and even absent over considerable areas.

The distinction between the glandular and interstitial forms of endometritis is most evident in the chronic forms. These chronic forms may originate from the acute forms, or may be chronic from the beginning. Many may have no direct connection with infection, but may be the results of circulatory changes. These circulatory changes may be due to displacements, to prolapses, to interference with venous return because of adhesions, tumors, or malformations. What has been written in reference to catarrhal inflammation may well be considered in this connection. On the other hand, many forms of chronic interstitial endometritis and of chronic metritis may be directly traced to infection. This infection may be present at the time in nonvirulent form. One very common variety is the form called subinvolution of the uterus.

Chronic puerperal endometritis-metritis or subinvolution is due primarily to puerperal or postabortive infection. It is characterized by failure of the uterus to return, after the usual time, to the normal nonparturient condition. Normally this process of involution after full-term labor takes about three months for completion. The uterus decreases in size in definite proportion to the advance of time. Any cessation or slowness in this regular involution of the organ must be considered pathological.

According to the modern view, subinvolution is looked upon as *due to infection*. The infectious process may have been very acute and severe or may have been so mild that no marked symptoms were

observed. In the times when obstetricians did not employ the strict aseptic measures now deemed necessary, subinvolution was more frequent than now, and was usually attributed to allowing the patient to get up from bed and go about too early.

The *anatomical characteristics* of this form of uterine infection are general enlargement of the whole organ; thickening of the endometrium and muscular wall; increase of connective tissue between the muscle fibers, enlargement of the muscle fibers; proliferation and thickening of the vessel walls, widening of the lymph vessels; more or less thickening of the peritoneal coat; increase of connective tissue fibers and of round cells in the interstitial portion of the endometrium, and more or less hyperplasia of the glandular portion.

Bacteria are usually present in the discharges and within the tissues during the earlier stages, but may be entirely absent during the later stages. Such bacteria as are found are usually streptococci. When a previously latent gonorrhea has been awakened into a subacute infection during the puerperium, similar appearances to those here described may be found, but the gonococcus may be the only microbe discovered.

Glandular endometritis may exist with little appearance of inflammation in the interstitial tissue of the mucosa or musculature.

Hyperplastic glandular endometritis has been described by Ruge, who laid out an elaborate exposition of its pathology. He distinguished the hyperplastic and the hypertrophic forms of glandular endometritis. The hyperplastic form was marked by an increased number of glands, as seen in sections of the endometrium. This increase in glandular structure could go so far as to resemble adenoma, indeed, in individual specimens even the distinction between benign and malignant adenoma of the corpus was sometimes difficult.

Besides being apparently increased in number, the glands were found to branch more abundantly and to exaggerate the usual corkscrew appearance. The thickness of the whole mucous membrane was enhanced by this increase in the glandular elements and by an accompanying increase in the thickness of the interstitial elements. The thickness of the endometrium was often three to ten times that of the normal endometrium at the resting stage. Microbes were seldom demonstrated.

Hypertrophic glandular endometritis was characterized by no

increase in the number of the glands, but by an increase in their surfaces. This produced changes in the form of single glands due to increased proliferation of their epithelium, to sac-like projections of their lumens or to increase in length of the glands.

Later observers were inclined to consider both the hypertrophic and the hyperplastic varieties only as variations in the appearances of the same thing. Ruge's conclusions were based chiefly upon the microscopical examination of portions of uterine mucous membrane removed by the curette. These portions of hyperplastic endometrium are the so-called granulations of early workers in gynecology.

Relation to Menstruation.—Within the last few years Hitschmann and Adler have made extensive observations upon the endometrium of uteri removed during various stages of the menstrual cycle. They have found that all of the appearances considered as hyperplastic and hypertrophic glandular endometritis could be demonstrated in the endometrium of uteri undergoing the congestive stage of menstruation. In the light of these observations, if one looks over the description of hyperplastic glandular endometritis and of the normal appearances of the endometrium during the congestive menstrual stage, he will be struck with the remarkable resemblance.

The changes observed by Ruge and designated as hyperplastic glandular endometritis are such as would be caused by *increased blood supply*. Since such increased blood supply is present at the time of the congestive stage of menstruation, the menstrual changes occur. It seems evident that the changes described as those of hyperplastic endometritis vary, not in kind but only in degree, from those of menstruation. Hitschmann and others have demonstrated in the menstruating uterus margins of variation as great as those described in so-called hyperplastic glandular endometritis.

It is probable that there is a middle ground. The same irritating factors which will produce increased blood supply with consequent hyperplasia and increased secretion of glands may, in the uterus, give rise to changes similar to those of menstruation but apart from menstruation. Both are manifestations of congestion, the one pathological and the other physiological.

Disturbance of function of the ovaries may have some causal relation to the changes known as hyperplastic endometritis, as well as to

certain disturbances of menstruation. It is pretty well believed that the periodical congestion of the uterus and pelvic organs which occurs with the menstrual cycle is due to the chemical action of hormones produced in the ovary or in the corpus luteum. Disturbances in the ovary may so modify its function of internal secretion as to cause increased stimulation to uterine congestion. Thus an increased activity of the ovarian internal secretion is probably the cause of some of the forms of menorrhagia not due to causes within the uterus itself.

Clinically the *symptoms of glandular endometritis* which have often led to performance of curettage are such as might well have been produced by overstimulation of uterine congestion. Such symptoms are menorrhagia, discharge of mucus in abnormal amount from the uterus and feeling of weight and bearing down in the pelvis, which can be accounted for by pelvic congestion. Unless one curettes the uterus at a time when he knows the endometrium is not normally hyperplastic, namely, at some time remote from the congestive stage of menstruation, he can not be sure that the findings in the scrapings are not due to the changes of normal menstruation.

ENDOCERVICITIS

The etiology and pathology of acute infection of the cervix uteri are so like the conditions in the corpus that no further comment is needed.

Chronic infections of the cervical mucosa (endocervicitis) and of the musculature show some variations due to the anatomical differences between these structures and those of the body of the uterus.

In the cervical mucous membrane, the round cell infiltration usually occupies the more superficial layers. The epithelial layer is more likely to become partially necrotic, and ulceration is more likely to develop.

A **hyperplasia** of the multitudinous folds of the cervical mucous membrane, due to local infection or to vascular congestion from more distant causes, is a real thing in the cervix, if not in the body. This hyperplasia may be localized so that a certain portion of the cervical endometrium extends out into the lumen, acquires a pedicle, and grows in the form of a *mucous polyp* into the cavity of the cervix or out into the vagina.

Chronic inflammation of the cervix is often manifested by closure of the mouths of the tubular glands of its mucosa and the formation of retention cysts. These cysts become filled with a glairy mucus, or with a mucopus. They are the *ovula Nabothi* which appear under the mucous membrane of the cervical canal and of the portio, looking and feeling like embedded shot. The cysts work outwards towards the surface of the portio from the depths of the crypts formed by the invaginations of the networks of the arbor vitæ of the cervical canal.

Erosions.—In many cases of infection of the cervix there appear, at the margin of the external os and extending outwards upon the portio vaginalis, one or more areas of reddish purple velvety growth which bleed easily when touched. The microscope shows these areas to be composed of ciliated cylindrical epithelium which has grown out upon the portio where formerly the surface was covered with normal flat stratified epithelium like that of the rest of the portio and of the vagina.

The original flat-celled epithelium has become eroded by the action of irritating and macerating discharges flowing from the cervical canal and bathing the surface. The cylindrical cells grow over this eroded surface and replace the flat cells. Such appearances are often erroneously called ulcerations. The proper and usual name is *erosions*. Sometimes the cylindrical epithelium takes on a papillary growth and is then called a *papillary erosion*. It is probable that erosions may sometimes arise from rupture of the outer surface of a retention cyst (ovulum ·Nabothi) at the surface of the portio vaginalis and a proliferation of the cylindrical epithelium thereof. Such are sometimes called *glandular erosions*.

True *ulcers of the portio* are practically always caused by syphilis, tuberculosis, or carcinoma. They resemble ulcers of the same kinds elsewhere.

Infection of Vulva and Vagina

The intact covering of the vulva and vagina is not subject to pyogenic infection. It is necessary that some lesion, some loss of integrity of the superficial tissue, shall have occurred in order that the streptococci or other microbes may gain entrance to the deeper layers. For this purpose a very slight abrasion or scratch is sufficient.

Chief among the causes of such lesions are the *traumatisms of labor*. Other causative factors are operations, coitus, masturbation, foreign bodies, and accident. Various microorganisms are usually present upon the surface and within the folds of the mucous membrane of the vulva. The active traumatic cause of the infection of the vagina usually brings with it the microbic cause of the consequent infection.

Maceration of the epithelial layers of the mucous membrane by irritating discharges due to lesions higher up in the genital tract, or to dribbling of irritating urine, may cause loss of such epithelial layers, and exposure of the subjacent tissues to infection. Uncleanliness, which permits accumulations of sebum, mucus, blood, and macerated flakes of epithelium within the vulvar folds, may result in infection of the submucous tissues after some of the epithelium has been destroyed. Such accumulations may cause infection of the epithelium of the sebaceous, mucous, and sweat glands of the vulva.

So-called **granular vulvitis and vaginitis** is due to swelling and hypertrophy of the papillæ, like that of the skin under similar conditions of maceration and infection. They are characterized by small round protuberant granulations scattered thickly over the surface. Such appearances are sometimes seen in cases of gonorrhea, where the mucous membrane of the vulva and vagina is bathed and macerated by gonorrheal pus.

Follicular vulvitis is due to infection of the sebaceous follicles of the vestibule, labia minora, and other portions of the vulva. The infective agent is usually a staphylococcus. The result is a hyperemia of the follicles, an increased secretion, and an appearance of redness around the mouths of the glands, which gives a speckled look to the whole affected area.

Often the openings of the glands are closed by adhesive inflammation, and an infected retention cyst of the sebaceous follicle is formed. Infection and inflammatory appearance extend beyond the gland tissue itself and thus produce a *furuncle*, similar to a "boil" elsewhere on the skin.

Streptococci of certain strains, gaining entrance through some minute point of injury, may give rise to *erysipelas of the vulva*. This may extend throughout the vagina, over the skin of the labia majora, and even far out upon the thighs and abdomen. Such infec-

tion, or similar infection, may travel along the lymph channels to the pelvis, or to the inguinal regions. Cellulitis of the pelvis, and pelvic abscess may result from the lymphatic infection. Exceptionally the infection may extend to the peritoneum.

The *vulvovaginal (Bartholin) glands* may occasionally become infected with streptococci, or staphylococci, or with the bacillus coli communis. In such infections the inflammatory reaction is likely to be greater than in the more usual infection with the gonococcus. The surrounding edema is more marked, the redness and swelling more wide-spread, the destruction of the glandular epithelium more extensive, and rupture of the abscess quicker. The vast majority of cases of infection of the vulvovaginal glands which are not due to pure cultures of the gonococcus are mixed infections of that microbe together with septic germs. Pure cultures of streptococci or of staphylococci in these glands are rare.

Infection of the vulva in general is accompanied by edema and increased local leucocytosis, so that the mucous membrane is swollen, reddened, and tender. The labia minora often attain considerable size. In chronic infection, or in cases where congestion or irritation from other causes has been acting for a long time, the labia minora may hang out of the vulva like flaps. An extreme degree of this is sometimes seen in the so-called Hottentot apron, which has been described by African explorers. Persistence of chronic inflammation of the labia majora may cause a high degree of edema of the connective tissue spaces, and of hypertrophy.

Infection of the clitoris may arise from its glans and prepuce. These may adhere so that the clitoris is enclosed in a hood. The accumulation of decomposing sebum from the follicles of these parts may irritate the nerves enough to cause sexual stimulation. This may in turn cause masturbation, which itself continues the irritation and traumatism. On the other hand, the hooded prepuce of the clitoris may heal and the resultant formation of scar tissue may compress the clitoris enough to cause atrophy of that organ. Hence arise some cases of loss of sexual feeling, so-called frigidity in the female.

Adhesions of the Labia.—Infection of the vulva, as well by the gonococcus, as the septic microbes, may result in adhesions of the labia minora, which may be almost sufficient to close the vulvar slit.

Such results are sometimes seen following neglected cases of vulvo-vaginitis in children.

Infection of the Tubes

More than eighty per cent of the cases of infection of the tubes (*salpingitis*) are due primarily to the gonococcus. The streptococci are responsible for something over fifteen per cent. Staphylococci are rarely found, either in pure culture or in mixed infections.

The *infective agent enters the tube* chiefly through the uterine cavity; next by way of the blood and lymph channels; next from the adjacent portions of the intestinal tract, and lastly from the already infected peritoneum. Septic infection often enters by way of the lymphatic channels from infectious areas lower down in the genital tract, less often from the infected uterus by continuity of mucous membrane.

The great majority of cases of septic infection of the tubes arise in the course of infection following *labor and abortion*. Infected areas in the cervix very easily extend into the areolar tissue around the upper vagina, the cervix, and the lower part of the uterine body. Thence, by way of the lymphatics, the process may extend upwards within the folds of the broad ligament, outwards along the mesentery of the tube, especially at the ampullar end, and then infect the tube, both walls and cavity. So also may infection pass to the distal end of the tube from thrombotic veins of the broad ligament. Curettage or other intrauterine operative procedures are far too often responsible for the direct infection of a tube from an infected endometrium.

Infection of the tube from the germ-laden *contents of the intestinal canal,* notably the rectum, sigmoid, and appendix, is not rare. When the tube, on account of adhesions between itself and the gut, becomes attached to some part of the intestinal tract, streptococci, putrefactive bacteria, colon bacilli, and other germs may easily migrate through the walls of intestine and tube into the lumen of the latter.

This infection of the tube, however, is probably more often the result of secondary infection of a pyosalpinx or of a hydrosalpinx originally caused by gonorrhea. The enlarged tube is brought into close relation with the gut, and both are likely to be covered with exudate which causes tube and gut to adhere. Perhaps later, per-

haps even after the contents of the tubal sac have become sterile, the bacteria from the intestines may migrate into the tube. The presence of such putrefactive intestinal microbes accounts for the foul odor frequently observed in the contents of pus tubes, although there may be no actual connection between the tube and gut.

Septic infection seldom passes from an infected peritoneum to the tube, although this avenue is not uncommon for tuberculosis. Occasionally septic microbes may infect the tube, being carried thither by the blood stream. Pyemic abscesses may occasionally develop thus in the tube.

The *anatomical appearances* of acute and chronic pyogenic infection of the tubes resemble very much the appearance in gonococcus infection and have been described in that connection. In the cases of streptococcus infection there is more likely to be a deeper involvement of the walls of the tube, a greater infiltration with lymph and leucocytes and a consequent greater thickening of the tube. In cases of acute infection following labor and abortion, the tubal infection is usually only a part of a virulent infection involving the uterus, parametrium, and peritoneum.

Infection following labor and abortion, as well as from other causes, except gonorrhea and tuberculosis, is more likely to extend to the connective tissue spaces of the parametrium and the areolar spaces of the pelvis in general than to the tubes. Therefore, one may say that septic infection is prone to cause parametritis and so-called pelvic cellulitis rather than salpingitis.

Infection of the Pelvic Connective Tissue—Pelvic Cellulitis— Parametritis

Septic infection usually reaches the pelvic connective tissue, that is to say, the areolar tissue filling in the spaces around the vagina, the cervix, the uterus, and within the folds of the broad ligaments, from infectious atria in the external genitals, the vagina, the cervix, and the uterus. This infection is taken up by the lymph channels of the part, and carried to the cellular tissue of the pelvis.

The main causes of septic and saprophytic infections that reach the pelvic connective tissue are *labor and abortion*. An especially frequent cause is *infection of a lacerated cervix*. The first result is an exudation of lymph and leucocytes into the areolar spaces, usually

those on one side of the uterus. The swelling thus formed displaces uterus, tube, and ovary, and disturbs the bladder and rectum by pressure. Toxins are rapidly absorbed into the general circulation, unless the protective wall of leucocytes is speedily formed.

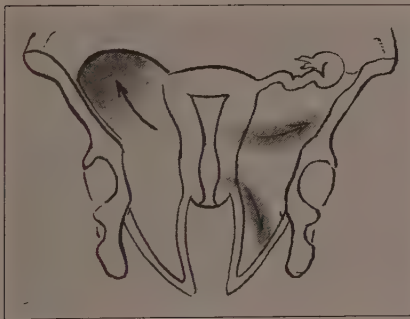Fig. 119.—Entrance of infection in pelvic connective tissue.

Fig. 120.—Extension of infection in pelvic connective tissue.

The *infected lymph soon becomes pus* and is localized. The result may be opening of the abscess or its absorption and the formation of a cicatrix which contracts and further deforms the relations of the pelvic organs. It is rare that the peritoneal surfaces of the portions of the pelvic ligaments concerned do not also become involved.

Infection of the Peritoneum—Peritonitis

The peritoneal cavity is one cavity, including that of the general abdomen and that of the pelvis. Infection of any part of it is likely to be extended to other parts. It is only the marked tendency of the peritoneal surfaces to stick together and to form adhesions which prevents every infection of a portion of the peritoneal sac from reaching every other portion. The absorptive surface of the peritoneal sac is immense. Its area is almost equal to the skin area of the individual. Its absorptive power is immensely greater than that of the skin, area for area.

The *dangers of peritonitis* arise chiefly from this very absorptive quality of the membrane. If there is any quantity of material which serves well for culture medium within the cavity, such as pus, blood, serum, urine, amniotic fluid, ascitic fluid, cystic contents, or intestinal contents, and if microbes are present also, the toxins resulting from the growth of such microbes are rapidly absorbed by the peritoneum and may rapidly give rise to serious symptoms or death.

Bacteria alone, with little material in which to grow, can be borne by the peritoneum in almost incredible numbers. Indeed, the peritoneum is less prone to infection than most tissues of the body. It will take care of a large amount of infectious matter, but it can not with impunity bear a continuous supply. For example, it will overcome or resist the virulence of the germs in a considerable collection of pus, but can not stand a small continuous drain from a minute perforation of intestine or stomach.

The *sources of infection of the peritoneum* in women are mainly by way of the genital organs and especially because of infection thereof with the gonococcus. In nearly every case of infection of the tubes, there is also more or less infection of the pelvic peritoneum. The serous coats of the uterus, pelvic ligaments, ovaries and tubes are very often involved in metritis, in pelvic cellulitis, in oophoritis, and in salpingitis, respectively.

The tendency of most forms of peritonitis, especially of those which interest the gynecologist, is to form adhesions between peritoneal surfaces. This tendency is most benign. Adhesions soon wall off the infected area and limit the process. The dependent position of the pelvis in nearly every posture of the woman aids in this limitation.

Infectious matter entering the peritoneum from some source in the upper abdomen tends to *gravitate* and successively to infect every peritoneal surface which it touches, until it reaches the bottom of the pelvis. Thus rupture of an ulcer of the stomach will allow much highly infectious material to escape into the general peritoneal cavity. Unless the patient should at once lie on the back with the hips elevated, this material will flow down towards the pelvis before the formation of adhesions can work to localize its action and to imprison it between adherent folds of peritoneum.

If a pelvic abscess or a pyosalpinx opens into the peritoneal cavity, its contents will remain in the pelvis—usually in the posterior cul-de-sac—where adhesive inflammation of peritoneal surfaces will speedily localize it.

A useful organ in limiting infection in the peritoneum is the *omentum*. This apron-like structure covers the front of the abdominal cavity and extends even to the pelvis. It is ever ready to take part in the formation of adhesions and in the shutting off of infectious areas from other areas not infected.

Irritation of the peritoneum, on account of infection or otherwise, results in exudation of fluid from the blood in its capillaries. The vessels also dilate under stimulation of the irritation of toxins. Next comes the exudation of fibrin and leucocytes. The fibrinous deposits glue the peritoneal surfaces together, and incipient adhesions are formed. In some places the endothelial layer of the peritoneum is lost and the glistening surface is changed to a finely granular appearance. At the same time dilatation of the vessels causes the surfaces to appear reddened.

As the acuteness of the attack subsides, the fibrous adhesions organize into *cicatricial tissue* and the peritoneal surfaces of different organs and folds become more or less firmly united. The union grows firmer with the passage of time. Contraction of such cicatricial material tends to draw the different organs and peritoneal folds out of place so that considerable deformities may result.

If the abdomen is opened in a case of acute peritonitis, *injection of the vessels* of the intestinal walls and of the omentum is the most striking feature. Even in the stages before the exudation, cultures from the surfaces of the membrane will yield large numbers of microbes; the streptococcus, the colon bacillus, or putrefactive germs in pure or mixed cultures. The appearances are similar for infec-

tion by the gonococcus, except that the exudation and adhesion forma-
tion is manifested much sooner than for the other infectious agents.

Soon comes an *exudation* of serous fluid, later clouded with fibrin
and leucocytes. The fibrin sticks to the peritoneal surfaces of organs
and attaches them to each other. The endothelial cells of the
peritoneum are injured or destroyed by the action of the toxins. The

Fig. 121.—Adhesions in and around rectouterine pouch following pelvic infection.

loops of intestine in the infected area become distended on account
of paralysis of their muscular coats from the toxic effect of the microbic
excretions.

Repair.—Only in light degrees of peritonitis does the membrane
become entirely restored to health. Where fibrinous and purulent
exudation have been marked, that portion of the peritoneum af-

fected recovers only by formation of organized adhesions. Abscesses may collect in circumscribed portions of the peritoneum separated from the general cavity by adhesions. These may disappear by absorption, or may break into the outer world, after burrowing along between the layers of the abdominal wall. They may break into some hollow viscus, or may break out from the circumscribed area into the general cavity and cause general peritonitis.

CHRONIC PERITONITIS

Acute peritonitis passes through successive stages into the chronic forms characterized by the appearance of permanent adhesions, agglutinations of surfaces and thickening of the peritoneal coatings of the affected organs.

The forms of chronic peritonitis which concern the gynecologist are chiefly those adhesive forms which mat together tubes, ovaries, omentum, sigmoid, rectum, and often bladder with the uterus and the pelvic ligaments. It is connected with chronic infection of each and all the pelvic organs, and can not profitably be considered apart from such organs. It is mainly a question of how much or how little of the pelvic peritoneum will be affected. That question depends upon how extensively the different organs are themselves affected.

Infection of the Ovary—Ovaritis—Oophoritis

Academically and anatomically one may divide the infectious inflammations of the ovary into follicular, interstitial, degenerative, exudative, proliferating and perioophoritis. These different forms of inflammation are so closely allied and so commonly exist in varying degrees in the same case that such distinctions are not practical. It is more convenient to divide them into acute and chronic forms of ovarian infection.

ACUTE OOPHORITIS

Acute oophoritis may be understood as swelling of the organ in consequence of hyperemia, exudation of blood fluids into the tissues, and perivascular infiltration with leucocytes. It results in degeneration and disappearance of the follicles, and the formation of abscesses. As a rule other parts of the genitals and the pelvic peritoneum are also involved in the process.

The cause is infection and the absorption of bacteria or their prod-

ucts. Among the causal factors in this infection are gonorrhea, wound infection (as from child-bearing), appendicitis, extension from other portions of the intestinal tract, and tuberculosis. In other words, the etiological factors are the same as those of infection of the tubes, peritoneum, pelvic cellular tissue, and uterus.

The entrance of infection may be by way of the peritoneum, the parametrium, the lymphatic channels of the hilum of the ovary, or the blood stream. The last way of infection occurs most often in general infectious diseases like scarlatina, diphtheria, and typhoid.

The whole organ becomes swollen and hyperemic. It is infiltrated with serum, leucocytes and some red cells. The follicular epithelium becomes loosened and exfoliated, the contents of the follicle become clouded, and the ovum dies. The external layer of the ovary, the germinal epithelial layer, and the peritoneum in the neighborhood, become likewise affected.

Adhesions take place and the external layer becomes thickened. Abscesses frequently form in the follicles and in the stroma, as well as in the corpus luteum. The infection, in common with infection of the other pelvic organs, may extend farther into the regions of the pelvis and abdomen by way of the lymph channels or by thrombophlebitis.

The outcome may be absorption of the exudate and cicatrization of the ovarian tissue, and the final may be atrophy of the organ. Abscesses may remain for an indefinite time and rupture into a tube, the gut, the bladder, the parametrial connective tissue, or into the outer world by way of the uterus or vagina.

The swollen ovary may not follow this course, but may gradually lose the virulence of its infection and remain as a chronically inflamed organ, infiltrated with lymph, hypertrophied as to its connective tissue, and with chronic congestion of its blood vessels.

Chronic Oophoritis

Chronic infection of the ovary, often called *ovaritis*, existing alone, is far more rare than its frequent diagnosis would lead one to believe. By many practitioners, the term is a convenient explanation of pains in the pelvis when lesions of the genitals can not be demonstrated, and especially when digital examination of the ovary evinces tenderness. Most often these symptoms are due to neuralgic pains referred from disorders of the cecum, appendix, or colon. The size

of the organ is not a good indication of enlargement, because ovaries
vary widely within normal limits.

There is, however, a chronic oophoritis which can be demonstrated
anatomically and microscopically, but it is usually accompanied by
chronic inflammation of neighboring organs which overshadows it.
It is possible that irritations which lead to congestion may sometimes,
if continued for a long time, produce appearances similar to those
of chronic inflammation. Such may be sexual excesses, persistence in
abnormal forms of sexual intercourse, chronic heart and liver dis-
orders, and alcoholism.

On the other hand chronic oophoritis is usually due to a former
acute infection of the ovary or to chronic infections of the other pel-
vic organs which lead to an infection of the ovary, chronic from the
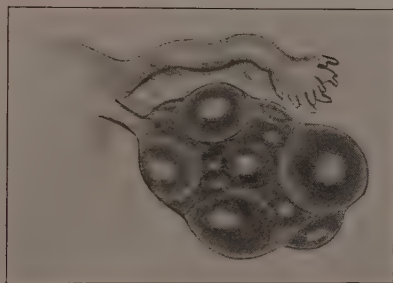
Fig. 122.—Small cystic ovary.

start. The chronic infections of the other organs produce the appear-
ances of oophoritis because of the passive congestion which they
cause in the pelvis.

The *affection is usually bilateral* but seldom symmetrical. The
ovary is often bound to other organs by adhesions, its surface is more
corrugated and its consistency is denser than normal. Section shows
the cortical portion thickened and dotted with a large number of
atrophic follicles.

Cystic Ovary

Many of these diseased follicles are distended into cysts. Chroni-
cally inflamed ovaries are usually, therefore, cystic ovaries. This
condition is sometimes called small cystic degeneration. The al-
buginea is thickened, the parenchyma of the cortex directly under the

albuginea is more than usually rich in cells. Towards the hilum, the stroma is hypertrophied. Sometimes there are areas of endarteritis obliterans. Veins and lymph vessels are often dilated.

Cystic ovary may be due to general diseases, especially to scarlatina and the other exanthemata, to syphilis and tuberculosis, and to arterio-sclerosis. In the ovaries of young children, large numbers of minute cysts of the follicles are often found. In most of these cases there are histories of some of the acute infectious diseases. In old women
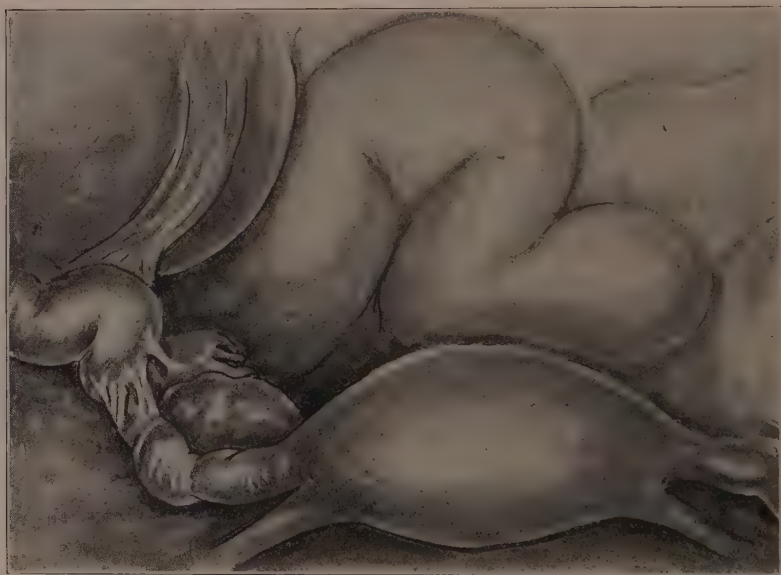
Fig. 123.—Adhesions between appendix and tube.

the ovaries become more dense with connective tissue, but usually contain numerous small follicular cysts. This form of cystic degeneration seldom causes any symptoms and is seldom recognized except at operation or autopsy.

APPENDICITIS AND PELVIC INFECTION

Infections of the appendix and of the pelvis often exist together and usually have a mutual causal relation. The infected appendix may become adherent to a tube, ovary, or uterus and may transmit the infection to the other organ. Conversely, infection of the pelvic

organs may cause them to adhere to the tip of the appendix. Appendicitis may result from transmission of the infection thereto.

Symptoms and Clinical Course

The clinical study of septic and saprophytic infection of the female genitals can best be studied as a whole instead of considering each portion of the tract separately. It must be remembered that septic infection in general is essentially the same throughout the body, being especially modified by the anatomical or physiological characteristics of the particular tissue or organ which may be mainly affected.

Mild Puerperal Infection

A detailed consideration of acute puerperal infection belongs to works on obstetrics. The first symptom is likely to be a chill within three or four days after delivery, with fever of two or three degrees. In some cases of prolonged dry labors, fever is already present before the uterus is empty. General malaise, aching muscles, anorexia, diminished and concentrated urine, dryness of mouth and thirst, with quickened pulse and respiration accompany the rise of temperature. At the outset the lochial discharge diminishes. If the uterine tumor is found to be much larger than the day of the puerperium would indicate, the infection is probably more saprophytic in character than septic.

The introduction of a finger or an intrauterine douche point will probably cause the expulsion of retained blood and clots, perhaps ill-smelling, with a diminution of the severity of the symptoms. Such a condition is called *lochiometra*, meaning retention in the uterine cavity of a collection of lochial discharges. When the symptoms are due to *retention of pieces* of placental or decidual tissues which have become infected with saprophytes (streptococci or bacilli) there will often be a succession of moderate rigors with moderate fever.

As a rule slight pain and often considerable tenderness over the uterus will be manifest. There will rarely be much change in the urine (taken by catheter to avoid contamination), except a concentration. Leucocytosis of a moderate or considerable degree will usually be observed. As a rule there will be little distention of the intestines. The outcome of this type of infection is usually favorable. The symptoms subside in a few days or gradually within a few weeks, unless unwise meddling treatment has been employed.

Acute infection postabortum of this type, due to retention of clots or portions of ovum or decidua, will show similar symptoms and will follow a similar course.

Severe Puerperal Infection

Acute infection postpartum or postabortum of a severe type may begin with one or two severe chills, followed by continued rise of temperature, rapid less of strength, high rate and weakness of pulse, rapid respiration, sweating, restlessness and nervousness, anxious facies, and every appearance of being very ill. This form may often be unaccompanied by any pain. Frequently there will be a sense of well-being which is belied by the evident condition of great physical depression.

In fulminating cases of *bacterial invasion of the blood* current by streptococci the clinical appearances may resemble uremia. There may be anuria, nausea, vomiting, retching, dryness of skin and mucous membranes, sometimes delirium or coma; all within a few days or even a few hours. Sometimes the bowels are obstinately constipated and sometimes there is a free diarrhea, perhaps with involuntary evacuations. Symptoms referable to the genitals may be entirely wanting beyond slight tenderness on palpation of the uterus and adnexa. Blood cultures will show streptococci. If the streptococci are hemolytic (dissolving the hemoglobin of the red corpuscles) the case is most severe and the prognosis the worst.

Peritonitis.—By whatever atrium it enters, the infection may speedily reach the peritoneum. In such cases there will be tenderness of the whole pelvic region, perhaps extending upwards into the abdomen. The intestines will fill up with gases which will give rise to colicky pains in the belly. The bowels will be costive. The abdomen will become progressively more and more tympanitic.

As the case advances, the intestinal walls will become paralyzed and pain will cease. The organs of the chest will be compressed by the gaseous distention of the abdomen, and the action of the heart and lungs will be impeded. The pulse rate in acute, general, or extensive localized peritonitis is usually higher than would ordinarily accompany the given degree of fever. The temperature may not be high, indeed, may be subnormal, especially in the severest cases.

The height of the fever and the amount of the leucocytosis are usually *measures of the resistance* of the organism to the infection.

Moderate increase of either indicates that the system is reacting favorably. Extensive rise of either indicates that there is an especially severe type of infection which calls out all the efforts of the body to resist. Subnormal leucocytosis or subnormal temperature indicates that the body is in danger of being overcome.

Infection from Other Causes.—Acute infection of the female, although almost always caused by the sequelæ of labor or abortion, may sometimes be due to other causes, but the clinical course will be similar.

Acute Pelvic Cellulitis.—Acute septic infections of the pelvic cellular tissue are almost always accompanied by infection of the uterus, cervix, or vagina, and are soon followed by more or less infection of the pelvic peritoneum. As the infection extends from its place of entrance to the areolar spaces of the pelvis, the fever runs higher and the general symptoms become more severe. Tenderness and pain in the pelvis are more marked. The increasing exudate presses on the bladder and rectum and upon the nerve terminations within the cellular tissue.

As reaction becomes established, the exudate becomes localized more and more specifically, and can be felt as an indefinite boggy, tender mass on one or both sides of the uterus, usually extending behind towards the median line. As the center of the exudated mass liquefies, the fluctuation of a true abscess may be felt.

Thrombophlebitis.—When a definite area of the endometrium becomes infected, such as the placental site, the resulting thrombosis of the uterine veins may extend to the veins of the broad ligament, to the iliac veins, and even to the femoral vein. No other signs or symptoms may exist except those of the infection in general until the thrombosis extends far enough to interfere with the return venous circulation from the leg.

Then comes edema of the whole limb with swelling, tenderness, local heat, and increase of the general fever. This condition is known as *phlegmasia alba dolens* or milk-leg.

The presence of a large number of leucocytes in the lymph of the affected limb gives the whole leg a milky, whitish appearance.

The thrombus, instead of extending towards the leg and interfering with its venous return, may progress upwards throughout the pampiniform plexus to reach the ovarian veins.

If the seat of the uterine thrombus was in the lower segment the

lower pelvic veins are more likely to become thrombotic. In any case the thrombosis of one portion becomes infected and the products of infection cause the blood beyond the infected area to clot and so form a thrombus. This also becomes infected in turn, and thus the thrombosis and the infection progress along the course of a system of veins.

Portions of these infected clots may become dislodged and be carried by the blood stream to distant parts of the body where they form embolic abscesses. This is the mode of origin of *pyemia*. This term means the development of foci of infection from infected emboli which are detached from a septic thrombus. With the formation of each new abscess, the chills and fever and general symptoms of infection start up anew.

Other symptoms accompanying the embolic abscesses will differ, depending upon the organ or part of the body where the embolus may lodge. If in the lung, there will be cough, increased rapidity of respiration, perhaps localized pain in the chest or pain referred to one breast, with other symptoms of pleurisy or pneumonia. If in the liver, there will be enlargement of that organ with tenderness, perhaps catching pains in the chest wall over the hepatic region, and often jaundice.

Abscesses may form in the subcutaneous connective tissue in any part of the body. The formation of each abscess is marked by local tenderness and by chill or fever. Later there will be redness and swelling of the affected area with fluctuation. Finally the abscess may open through the skin, or pus may burrow in various directions in the cellular tissue where there is least resistance.

Chronic Pelvic Cellulitis.—The symptoms of acute infection of the pelvic connective tissue above described may, on account of lessened virulence of the infecting microbes or increased resistance of the body tissues, be much less marked from the beginning so that the chronic form is in evidence from the first. As the exudate forms within the spaces of the pelvic areolar tissue and softens down into pus, the acuteness will gradually subside, and the chronic form result from the acute.

The temperature will be only slightly elevated, although there will usually be frequent exacerbations. The rate and character of the pulse will approach nearer to the normal. The pain and tenderness will diminish. Symptoms of pressure on the bladder, such as

tenesmus, pain during and after urination, frequency of micturition, and irritability of the bladder, will often occur. There will usually be pain with defecation, especially if the stools are hardened.

Bimanual examination and coitus will be painful. Usually dysmenorrhea and menorrhagia are the result. On account of the accompanying endometritis and endocervicitis, there is usually a vaginal discharge of pus, mucopus, and blood. If the local infection is overcome by the vital forces, as it often is, the inflammatory exudate will resolve and the regions of the parametrium affected will undergo cicatricial contraction. Therefore, the uterus may be drawn to one side or the other, or the organ may be laterally tipped because of more pull on the cervix than on the body. Thus various irregular displacements of the uterus may be produced.

Diagnosis

Differential diagnosis between infections of the different organs of the pelvis is often difficult and seldom very useful. The uterus and cervix have usually already been infected and the infection has extended to the parametrium. Therefore the symptom-complex will include evidences of infections of these structures as well.

When the infection has reached the pelvic connective tissue from points of entrance in the vulva, vagina, or perirectal tissue and has not traveled the usual route via the uterus, that organ will not be so tender or so large, nor will there be much discharge from the external os. The examining finger will feel the phlegmonous mass to one side of the uterus and upper vagina, will elicit tenderness on pressure there, or will perceive fluctuation.

Infection of the tubes or ovaries will often be present with infection of the pelvic cellular tissue because the microbes may reach these organs through the lymphatics or through the peritoneum. When all these structures are not simultaneously infected, the localization of the condition in the parametrium will be shown by the fact that the phlegmonous swelling or the fluctuating abscess will be felt to be more to one side and rather lower in the pelvis than when tubes or ovaries are involved.

The uterus is likely to be thrust to one side by the exudate in the parametrium, and forwards by inflammatory enlargement of the tubes and ovaries. Pus or inflammatory exudate in the cul-de-sac of Douglas is felt low down in the median line and pushes the cervix and lower

part of the uterine body forwards, thus causing more or less retroversion. It is rare that this last condition can be differentiated, before the abdomen is opened, from pyosalpinx and ovarian abscess. It is practically impossible to distinguish beforehand between inflammatory enlargements of the tubes and ovaries.

Practically, on the score of therapy, there is little use in such fine diagnostic distinctions. If there is considerable inflammatory reaction, as shown by fever, great tenderness, high leucocytosis, etc., and the inflammatory mass appears to be well matted down in the pelvis and to be pointing at the vaginal vault, one will open such an abscess through the vagina. If the case appears to be one where operative interference is not indicated, the same general and local measures will be employed as where operation is indicated. As a general rule, however, pelvic abscess within the cellular tissue of the parametrium will lie so low that it will press towards the vault of the vagina.

In the acute cases and in those which do not break down into pus, other measures than operative are generally indicated. There is greater mobility in most cases of pyosalpinx than in those of parametrial abscess. The sac is more fluctuating and more definitely rounded in the former. Since salpingitis alone is most often due to the gonococcus, there is usually less local and general inflammatory reaction than in parametritis. Where the peritoneum is considerably involved in the pelvic infection, there are more likely to be gaseous distention of the intestines and gastrointestinal symptoms than otherwise.

Intraligamentary myoma may sometimes be mistaken for pelvic cellulitis. It usually has a more regular contour, is harder, and more nodular, and is less likely to cause inflammatory symptoms. The uterus itself will usually be found to contain other myomatous nodules.

Psoas abscess and similar infectious collections in the fasciæ of the pelvic may sometimes appear like infections of the intrinsic pelvic organs. The exudative mass or the fluctuating sac will usually appear higher, even in the false pelvis, and sometimes towards the outer portion of Poupart's ligament. The history and the probable origin of such a condition will differentiate it from pelvic inflammation.

Infection of the cecum and appendix will sometimes cause difficulty in differential diagnosis between it and pelvic infection via the

genital organs. In the first place, the appendicular signs and symptoms are almost always on the right side, the tenderness is usually at McBurney's point, the right rectus muscle is the one that is rigid and pain is referred to that side. Salpingitis and ovaritis of septic nature are usually bilateral. In most cases there will be a positive history of gonorrheal infection, of labor, of abortion, or of other cause of infection by way of the genitals.

The most puzzling cases will be those where it is a question between a chronic or recurrent subacute appendicitis and a similar infection of the right tube or ovary. Bimanual vaginal examination will usually find the enlarged and tender tube or ovary lying to the right side of the uterus and towards the median line behind the uterus. Usually the tuboovarian tumor will be more or less adherent to the uterus and to the broad ligament. It must be remembered that not rarely infection of the appendix and of the right uterine appendages will be present in the same individual at the same time, either causally connected or coincidently.

Septic infection of the tubes is practically always accompanied by infection of the pelvic peritoneum and the uterus, therefore, a detached diagnosis of this variety of salpingitis is neither possible nor practical. The symptoms resemble those of gonorrheal salpingitis but are generally and locally more severe.

A mild streptococcus infection of the tube or a chronic passive congestion from former mild adhesive peritonitis may cause the appearances of so-called *catarrhal salpingitis*. A similar set of signs and symptoms may accompany a mild gonorrheal infection of the tube. There is an excess of mucus secretion in the lumen. This mucus may be retained because the fimbriated end is closed and the uterine end is swollen. The only symptoms of such a condition will be some dysmenorrhea and a discharge of mucus from the vagina. This discharge is due to the congestion of the uterus which coexists from the same causes and which results in the so-called catarrhal endometritis.

When the tube is completely occluded at both ends, the continual production of the seromucous secretion enlarges its caliber and often distends it to a degree as great or greater than pyosalpinx. This condition is called *hydrosalpinx*. It is not uncommon to find one tube in such a condition while operating for pyosalpinx of the other side, or for pelvic adhesions. It is doubtful whether a hydrosalpinx of moderate size causes any particular symptoms beyond those caused

by the endometritis and the pelvic adhesions. It is to be looked upon as a result rather than a cause. Hydrosalpinx is felt on bimanual examination as a fluctuating sac behind and to one side of the uterus.

The symptoms of the **chronic forms of endometritis-metritis** are twofold; subjective and objective. Subjective symptoms are dysmenorrhea, backache in the sacral region, and a sense of weight in the pelvis often due to prolapse of the pelvic contents on account of a relaxed pelvic floor. This latter condition is the most frequent cause of the congestive inflammation of the uterus. The objective signs are leucorrhea, increased menstrual flow, sometimes increased frequency of menstruation, and increased size of the uterus.
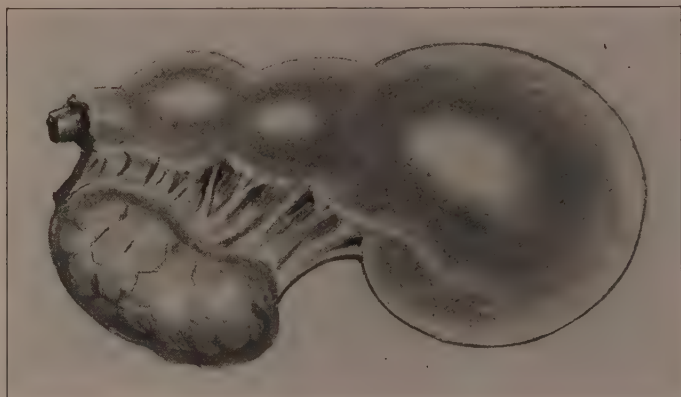
Fig. 124.—Hydrosalpinx.

In the conditions known as *glandular endometritis,* the diagnosis will be made by increased bleeding at the time of the menses, by irregular flow between the periods, and by the evacuation of granular masses by means of the curette. Under the microscope these masses show hyperplasia of the glandular structure of the uterine mucosa. This appearance must be taken into consideration with the time of the catamenial cycle. It will be remembered that the appearance of the uterine mucous membrane at the congestive stage of menstruation is similar to that in the so-called hyperplastic endometritis.

In all cases of chronic endometritis and endocervicitis there will be more or less *leucorrhea,* from a mere show of moisture at the vulva to a copious flowing which wets the thighs and stains the underwear. The leucorrheal discharge contains mucus, fatty material from de-

generation of epithelial cells, serum, leucocytes, epithelial debris, and sometimes a little blood. The discharge will also contain whatever microbes may be present. These may be saprophytic tenants of the canal or parasites which have been cast off from the living tissues of the endometrium. In active streptococcic or gonococcic infection there will be more leucocytes in proportion to the mucus.

Endocervicitis is characterized by the discharge of a greater proportion of mucus than corporeal endometritis. Often the mucus is cast off in the discharges in large slimy clotted masses, sometimes resembling the white of egg, raw or partly cooked. The acrid discharges from the inflamed endometrium and endocervix may macerate the squamous cells of the portio in the neighborhood of the external os and thus give rise to erosions.

Purulent and gonorrheal infection of rather an acute type will, in rare instances, cause loss of tissue deeper than that of the epithelium of the portio, and true ulcers may result, paved with granular tissue and exuding pus. As a rule, however, ulceration unless from traumatism, will cause one to think of syphilis, tuberculosis, or carcinoma.

The **diagnosis of subinvolution** is suggested first from the history of a recent abortion or labor. Usually there has been some fever. Often more or less extensive unhealed lacerations of the cervix are found. The uterus sags rather low in the pelvis, not so much because of its increased size and weight, but rather because of relaxation of the pelvic floor which usually accompanies the condition. There will be bearing down sensations, lumbar and sacral pain, and feeling of weight in the pelvis.

Often there will be malaise, general weakness, slight rise of temperature, especially in the afternoon, weariness on slight exertion, constipation, and frequency of urination. Examination will reveal a large tender uterus, rather low in the pelvis, and sometimes abnormally anteflexed upon the bladder. A leucorrheal discharge is always present, often of bad odor.

Acute erysipelatous infection of the vulva and vagina resembles the same disease in other mucous and cutaneous tissues. There is high fever, rapid pulse, great depression, scanty urine of high color and specific gravity, and usually albuminuria. Locally the mucous membrane is intensely red and swollen, dry and hard. There is marked edema of the submucous tissues, which may break down into

pus.   The pelvic lymphatics and those of the groin are usually
enlarged and tender.

Ulcers and infected wounds of vulva and vagina are much like
the same conditions elsewhere.   Infection of the vulvovaginal (Bartho-
lin) glands is usually by the gonococcus, but often is mixed with strep-
tococci or staphylococci.   The signs and symptoms are similar to gon-
orrhea infection of those glands.   The more the infection is influenced
by the septic microbes the more violent is the local and general in-
flammatory reaction, and the more marked the indurated and inflamed
area around the gland.

Follicular vulvitis caused by the staphylococcus resembles that
caused by the gonococcus.   It is due to infection of the sebaceous
glands of the vestibule, labia minora, and inner surface of the labia
majora.   The surfaces become spotted with reddened papules and
pustules.

The *clitoris* may be infected by staphylococci or streptococci, espe-
cially when the external genitals are not kept clean or are constantly
bathed in discharges from the upper tract.   The infectious matter is ·
more likely to cause infection when confined under a hooded prepuce.
Pus and increased sebaceous discharge with cheesy odor are marked
signs.   The result is often adherent prepuce with a train of neurotic
symptoms.

Prognosis

The prognosis of pyogenic infection of the female genitals depends
upon as many different factors as does prognosis of such infection
anywhere.   The same principles apply.

The severity depends upon the number and virulence of the invad-
ing microbes, the resistance of the body, the extent of the traumatism
which precedes the infection, and the treatment.   To a limited extent
the species of microorganism is a factor in the prognosis.   The strepto-
cocci usually produce more violent symptoms than the putrefactive
bacteria; those from a previous case of streptococcus infection more
than those of saprophytic character.

In puerperal and postabortive cases the sooner the symptoms begin
the more severe is the course of the case likely to be.   When there
have been extensive examinations in such cases and especially where
there has been prolonged and unfavorable use of instruments, the
prognosis is worse.   The infected cases in which a foul discharge is

present in the beginning are more likely to be milder than those without odor. In acute infections, the pulse is a better guide than the temperature curve. The longer the interval between the reception of the infection and the appearance of the symptoms, the better the prognosis.

Septicemia.—When, in spite of little or no signs of local disturbance within the pelvis, the pulse runs high, its quality is weak, the face appears drawn and anxious, the urine becomes scanty, concentrated, and albuminous, and in general the condition quickly appears grave, the probability is that there has been an entrance of bacteria into the blood current and the prognosis becomes very bad, especially if the infecting microbe is a hemolytic streptococcus. Repeated chills in the early stages are of grave import. Rapid falling of the temperature, pulse, and respiratory curves are favorable signs.

Exacerbations of fever with local points of new infection in other parts of the body are *evidences of pyemia* and are bad signs in respect to mortality or continued morbidity. Extension of a local area of infection to neighboring and surrounding regions, the enlargement or burrowing of abscesses and the continuance of suppuration, all tend to reduce the patient's resistance and lead ultimately to a fatal outcome or at best to prolonged invalidism.

Infected lesions of the vulva, vagina, and cervix, which do not extend along the lymphatic channels to the parametrium or pelvic peritoneum, usually heal rapidly under antiseptic treatment. Abscess cavities which drain well usually close without much general distubance, but, as soon as drainage becomes faulty so that pressure exists in the cavity, absorption of toxins or even of microbes occurs, or the pus burrows along paths of least resistance to more distant and sometimes to inaccessible parts.

Treatment

Prophylaxis

Prophylaxis is of the highest importance in acute infection of the female genitals and pelvis. It may be summed up as asepsis, and avoidance of unnecessary traumatism. Coitus should be avoided just before and during the menstrual flow. Douche points should always be made of a material which will allow of sterilization by boiling.

Napkins and absorbent dressings to the vulvar outlet should be as nearly aseptic as possible.

The shower *bath* is safer than the tub bath. In the latter the woman's movements may open the vaginal canal for the entrance of the bath water, which of course is never perfectly clean. The perfectly normal woman does not need the *vaginal douche* nearly as often as she commonly takes it. Douches before, during or soon after labor or abortion are seldom wise.

External douches, that is, fluids poured over the external genitals, will usually suffice for cleanliness. If the woman has an offensive or copious discharge from the vagina she is not normal and requires treatment. This may often properly include vaginal douches properly administered.

Wounds and lacerations of the vulva, perineum, and pelvic floor should be sutured as soon as possible. Prompt suture protects the wound surfaces from outside infection. The vulva should be covered by an aseptic absorbent dressing, which should be changed after each evacuation of bowels or bladder.

Puerperal *lacerations of the cervix* should not be sutured unless they are causing much hemorrhage. In practically every full-term delivery, and during most abortions, the cervix is torn on one or both sides. The lacerations tend to heal spontaneously because the edges are held together by pressure of the vaginal walls and because there is no muscular action which tends to pull them apart. It would be poor surgical policy to run the risk of carrying infection upwards from the vulva in attempts to suture a fresh laceration which will, in all probability, heal spontaneously.

The obstetrician and gynecologist should always ask himself whether anything which he proposes to do is likely to do any harm. He should do something only when he is persuaded that more harm is probable by refraining from doing than by doing.

The dangers of *infection of the peritoneum* by migration of bacteria from the intestinal canal should be minimized by emptying the bowels before every labor and operation.

A *properly conducted labor* means prophylaxis against infection in other ways than merely by the aseptic conduct of the case. A labor unduly prolonged may cause uterine atony which, because of faulty retraction, causes hemorrhage from the placental site. Some of the

blood clots in the uterus, and offers a good culture medium for any microbes which may reach it from below. Therefore, observance of the proper indications for accelerating labor is a large element in the prophylaxis of puerperal infection.

CURATIVE TREATMENT

Acute puerperal and postabortive endometritis-metritis is best treated conservatively. If the uterus is large and semifluctuating, it probably contains lochia, blood, or secundines. Sometimes massage of the uterus through the abdominal wall, as in Credé's method, will empty the cavity and the symptoms will rapidly decline. Sometimes it may be necessary to dilate the cervical canal by introducing a gloved finger. This may allow retained lochial secretions to escape. Exploration of the uterine cavity by a deeper entrance of the finger may find retained clots or portions of placenta. These may be removed at once by the finger aided perhaps by a placental forceps.

A single *uterine douche* of sterile salt solution is sometimes permissible to clear out the cavity of decomposing matter which is being acted upon by saprophytic microbes. Afterwards *ergot* should be given to cause uterine contractions, which will prevent further hemorrhage, will cause a squeezing out of the intermuscular spaces of the uterine wall, and will empty such spaces of serum and microbes. Ergot for this purpose is best administered in the form of the official fluid extract in doses of twenty minims to half a dram every four hours until the uterus contracts to a hard ball and remains so. The procedure is really a means of draining the uterine intermuscular spaces and the uterine cavity by pressure.

Ergot should not be continued for very many days. It should be stopped when constant sacral pain results. There are other reliable preparations of the drug which are equally useful in small doses, corresponding to that given above for the official preparation. *Hydrastis* is thought by many to aid in the action of the ergot. In a large number of cases of puerperal infection and of incomplete and septic abortions in his service in the Cook County Hospital, one of the authors has employed this method without operative measures, with gratifying results.

Operative measures, on the other hand, are still recommended by some good authorities, who advise emptying of the uterine cavity in cases of incomplete and septic abortions. This may be done pref-

erably by instrumental or digital dilatation of the cervix until the forefinger can be easily introduced into the uterus; then by separating the remains of the ovum from the decidua by sweeping the finger around its circumferences; and then extracting the pieces of ovum thus loosened. Often the finger alone will accomplish this, but sometimes a large blunt curette or half of a placental forceps may be needed in addition to the finger. It is unjustifiable to employ the sharp curette in any case of recent puerperium or abortion because of the danger of perforating the softened walls of the uterus.

If the exploring finger finds no clots or secundines in the uterus, and only a smooth interior, it is obvious that the infection is not saprophytic, but lies in the deeper tissues of the uterine wall, the parametrium, the peritoneum, or the blood current. If in the uterine wall, the ergot treatment will give the best results.

Perfect aseptic technic must be maintained in the above procedures and the hands of the operator must be covered with rubber gloves. In giving a uterine (sometimes erroneously called an intrauterine) douche the cervix must be drawn down by a vulsella so that the cavity will be straightened and a good return flow assured. The water pressure must be very slight because of the danger of forcing septic material into the tubes or into the lymphatic spaces.

Acute Pelvic Infection.—Acute pyogenic infection of the pelvic cellular tissue calls decidedly for conservative treatment. The patient should be placed in Fowler's posture, should have the intestinal canal emptied by catharsis, enemas and gastric lavage, and should be given normal salt solution in continuous enema by the drop method. If the rectum does not tolerate this, it may tolerate enemas of half a pint or pint passed through the rectal tube every four to six hours. Intravenous infusion of normal salt solution to the amount of a pint or more may sometimes be substituted, or injection of the same into the connective tissue spaces beneath the breasts, or elsewhere. As much water as possible should be taken by the mouth, and the diet should consist of fluids only.

It is rare that alcoholic *stimulants* are of value. Often they are harmful. Strychnine in doses of 1/40 to 1/30 of a grain every four hours and eserine 1/100 grain are useful stimulants, especially in combating a tendency to acute dilatation of the intestines. Aromatic spirits of ammonia, digitalis, morphine, or *sedatives* may be needed, according to the symptoms as they arise. One will, however, employ

morphine sparingly and only to obtain rest from severe pain. Hot fomentations to the abdomen, if properly prepared and often enough changed, are very useful.

Serum treatment of acute infection has not met with the success which was anticipated. There are, however, numerous instances of the apparent success of antistreptococcic serum. This preparation is furnished by the pharmaceutical houses which specialize in biological therapeutics. It is usually given subcutaneously or intravenously in doses from fifteen to twenty-five cubic centimeters once in twenty-four hours until two or three doses are given. Afterwards, if the effect is favorable, it is continued in smaller doses for several days, depending upon the temperature and pulse.

Vaccines, or emulsions of killed bacteria in sterile water, are usually more efficacious than serum. The frequent failures of anti-streptococcic serum may perhaps be explained by the differences in the species, variety, or strain of a given streptococcus. The particular species in question may not be the one which was employed to obtain the serum.

Vaccines have thus far proved more efficient in chronic forms of infection than in acute forms. The best results are obtained by *autogenous vaccines.* These are prepared from specimens of bacteria obtained from the infectious secretions of the patient herself. The time needed to get such autogenous vaccines makes them less useful in acute cases. In the acute cases where biological treatment seems most needed, the patient usually will have recovered or died before the remedy can be obtained. The most successful vaccines are those obtained from the lesions infected with staphylococci.

If one is to use vaccines in acute cases, he must usually employ those already prepared, so-called *stock vaccines.* These can be obtained from clinical laboratories or from commercial houses dealing in biological products. Seldom can one prepare his own, unless he has the advantages of a well equipped laboratory. In every large city there are several such laboratories, and, even in smaller communities, the distance from some good laboratory is seldom far.

Treatment of chronic infection of the female genitals and of the results of infection may be classified in two categories; medical and surgical.

Medical Treatment

Medical treatment in gynecology means not only the use of drugs, but is used in contradistinction to operative treatment. It embraces tonics, stimulants, dietetics, hygiene, exercises, baths, massage, laxatives, diuretics, douches, hot and cold packs, enemas, tampons, local applications, and pessaries.

The main object of *local treatment* by douches, enemas, packs, tampons and posture is to increase the local blood supply and the local leucocytosis. A hot vaginal douche, taken in the proper manner with the patient lying on the back, fills the vagina with hot water, distends the vault, and pushes the uterus and adnexa upwards, supplying heat, moisture, and a certain degree of massage. All of these tend to increase the local blood supply to the pelvic organs, to aid in the return circulation, and to increase the local leucocytosis. Warm enemas and hot abdominal packs aid in this direction.

Tampons distend the vagina, hold the pelvic viscera elevated, and stretch adhesions; and thus aid the venous and lymphatic circulation. If the tampons are impregnated with glycerine, the hygroscopic properties of that substance deplete the local vessels of the cervix, and, to a less extent, the peritoneum of the cul-de-sac and the lower pelvic cellular tissue. By osmosis, the contents of the uterine cavity are drained and, also by osmosis, any antiseptic drugs incorporated into the glycerine solution within the meshes of the tampon may enter the cervical and uterine cavities and act directly upon the endometrium.

Hot packs (fomentations) to the abdomen are useful helps to the hot douche and the tampon. All possible applications of heat and moisture tend, in the pelvis as elsewhere, to allay pain.

The **knee-chest posture,** properly assumed, allows the abdominal and pelvic organs to gravitate towards the diaphragm and thus stretches out the broad ligaments, decreases the venous congestion in the adherent matted pelvic organs, and allows room for the entrance of new blood by way of the arteries.

In the *regular office care of gynecological cases*, the tampons should be applied three or four times a week, and should be worn until the following morning. Then the tampons should be pulled out and a hot vaginal douche taken. Sometimes a warm enema should be administered. Often another hot douche should be taken in the evening

of the second day, and another on the third morning. During the third day the patient should return for another tampon, and so on.

This treatment should continue for weeks if improvement occurs. The intervals of the tamponade and the frequency of the douches should be gradually diminished until symptomatic cure results, or until it is apparent that more radical measures are indicated. Painstaking care and persistence on the part of doctor and patient will often so relieve the conditions that the woman will become symptomatically well. In almost all cases, the conditions will at least be so much improved that subsequent operative procedures will be easier and of better prognosis.

Local applications to the cervical and uterine mucous membranes are not often advisable because of the danger of traumatism and of conveying infection higher than it has already gone. In selected cases of endocervicitis and endometritis, careful use of local applications is permissible. Usually the cervical canal and os uteri should first be dilated by metallic dilators, to allow easy introduction of the uterine applicator.

The curative preparations employed should seldom be of an irritating character, and never caustic. Weak formalin solutions are sometimes useful, more often protargol or other albuminous silver salt. Iodine is rarely advisable. Asepsis as perfect as that required for operations is essential in every instance of local application to the endometrium. One must never lose sight of the danger of interrupting a possible pregnancy, and one should never make local applications during the menses.

Massage is a minor method often useful as an adjuvant in the treatment of chronic pelvic infections, especially in the later stages of adhesions and cicatricial formation. General body massage, skillfully given, is always useful for its general tonic effect. Abdominal massage strengthens the muscles of the wall and aids intestinal peristalsis. It is contraindicated in the presence of much tenderness or when inflammation is active.

Pelvic message by the *method of Thüre Brandt* has been actively used by his followers, although less now than a few years ago. It consists in manipulating the individual pelvic organs between two fingers passed into the vagina and the opposite hand placed upon the abdomen just above the pubes. It is dangerous in the presence of a

thin-walled pyosalpinx or in pelvic abscess. It may cause rupture of an ectopic gestation sac.

It is most often indicated in adhesions and cicatricial thickening. It is always open to the objection that it may excite sexual libido and may sometimes be sought as a substitute for masturbation. Many gynecologists, especially in this country, seem to think that its disadvantages do not permit it to be considered as useful as the treatment by hot douches, tampons, and such mechanical measures.

Baths, besides their general hygienic effect, have a local use in chronic pelvic infections. In connection with the hot douche, the hot pack, the tampon, and postural treatment, hot sitzbaths aid in relieving pelvic distress and also in producing local leucocytosis. The patient should sit in a tub filled well up above her waist with water as hot as can be borne for half an hour at a time. Hot water should be added so as to keep the temperature of the bath up to the point of tolerance.

Bier hyperemic treatment locally applied has some usefulness in the office treatment of chronic infection of the uterus, especially the cervical portion. The glass vaginal tube of the Bier apparatus, about one and one-half inches in diameter, and about six inches in length, is passed so that its open end encloses the portio vaginalis of the cervix. The closed outer end is fitted to a rubber tube which is attached to an air pump by means of which a partial vacuum can be produced within the glass tube. The extent of the vacuum can be regulated by a little valve in the course of the rubber tube.

Hyperemia is caused in the portio and to a lesser degree in the rest of the cervix. The suction also tends to drain the cervical and uterine cavities. The suction must not be too strong, or blood will be drawn. The cupping of the portio should be interrupted every few minutes for a few seconds at a time. The whole treatment at each sitting should last from ten to fifteen minutes.

The roentgen ray is coming more and more into use in the treatment of gynecological disorders, especially uterine tumors, and may soon become a useful measure in the treatment of pelvic infections especially in the cicatricial stages. It should, however, be employed only by those fully familiar with the uses and the dangers of the x-ray. The same remark applies to radium.

In treating all cases of chronic pelvic infection, the *condition of the alimentary canal* is of great importance. The diet must be nour-

ishing but not difficult of digestion. In pelvic infections the dietetic treatment of constipation by means of foods which leave a large fecal residue, although proper in most other conditions, is usually not indicated. It is not advisable to have the loaded sigmoid and rectum added to the burden already carried by the pelvis.

Mild laxatives must be employed to keep the bowels freely moved once or twice a day. Fruit juices will aid, but often cascara sagrada in small doses repeated three times a day will be necessary to effect the object. Occasional mild purging with salts of magnesium or sodium, such as the sulphates or phosphates, may be necessary.

To reduce putrefaction in the colon and sigmoid, *lactic acid bacilli* (bacillus bulgaricus) may be given in frequent daily doses. Tablets containing these bacilli in sugar, or tubes containing them in water, are furnished by the manufacturing druggists. The dose varies with the preparation. There are several varieties of fermented milk, rich in these bacilli, which may be obtained from metropolitan milk dealers.

Chronic infection of the vulva and vagina almost always exists in company with infection of the tract higher up, and is to be treated in this connection. Local antiseptics, especially the albuminous silver salts, are useful applications.

Many saprophytic, and some septic bacteria produce acid or alkali according to the food which is available to them. If the former, we have fermentation; if the latter, putrefaction. Carbohydrate media cause production of lactic acid among the products of fermentation. The antiseptic action of the Doederlein bacilli in the vagina is enhanced in an acid medium.

Therefore *sugar* sometimes becomes a useful article in treatment of some of the infections of the vagina and of the vulva. It is especially valuable in cases where there is necrotic tissue present. The discharges from sloughing cancer, for example, can often be rendered less offensive by use of sugar. The best preparation to use is powdered sugar, introduced through a tubular speculum and held in by means of a tampon. Such treatment may be repeated every day or two.

Surgical Treatment

Surgery of the female genitals should follow general surgical principles. Pus should be evacuated, unhealthy granulating surfaces

should be curetted, and hopelessly diseased parts or organs should be removed.

Abscesses remaining after phlegmonous inflammation of the areolar tissues of vulva and vagina must be opened and drained at the most convenient point. Unhealthy *ulcers,* which are not due to syphilis or to malignant disease, should be scraped by the sharp curette and dressed with some antiseptic powder or solution. Bismuth subgallate or subnitrate, powdered boric acid or sterile talcum, tincture of iodine, and argyrol solution are all useful to aid healing of ulcerated areas.

Abscess of the vulvovaginal glands may be opened and packed with sterile gauze, and so be allowed to heal from the bottom. If the surrounding induration and the acute inflammation are much reduced, it is well to attempt to dissect out the infected glandular sac and then to suture the wound.

Parametritic abscess can often be opened and drained through the vault of the vagina. The vaginal mucous membrane, at the point where fluctuation is felt most distinctly, should be incised as far as the connective tissue, and then a blunt instrument, such as a pair of closed forceps, should be pushed under the guidance of a finger into the fluctuating sac. Often the finger itself will suffice and is safer. It is seldom safe to use the needle of an exploring syringe to locate pus in this region. There is too much danger of puncturing intestine. Besides this, the pus is often too thick to flow through the needle. By opening the forceps as it is withdrawn, the wound will be enlarged, and bleeding will be prevented by the pressure.

The cavity may be loosely packed with gauze, or a rubber drain may be inserted and left in for a day or two. It is a mistake to leave glass drains or even rubber tubing in pelvic or abdominal cavities too long because of the danger of necrosis from pressure on important structures, such as ureters, arteries, veins, bladder, or intestines.

Posterior pelvic abscesses, either of the peritoneum or of the tubes, or tuboovarian abscesses may be opened and drained as above described, through the posterior fornix of the vagina and the cul-de-sac of Douglas.

Many of the symptoms which follow infection of the uterus, parametrium, tubes, ovaries, or pelvic peritoneum, are caused by the *cicatrices and adhesions* which displace organs and which restrict venous flow from the pelvis. In such cases, after it is found that non-operative measures are not successful or too slow, it is advisable to

open the abdomen and separate such adhesions or divide or remove cicatrices and replace displaced organs by one of the many intra-pelvic plastic operations.

If at the same time, as often happens, it is found that pus still remains in the tubes or ovaries, or localized in the pelvic cavity, the affected portions of such organs may be removed, or the abscesses opened and then drained through the vagina by incision through the cul-de-sac.

Hysterectomy.—In some cases there remain, after an acute infection of the uterus or of the pelvis, multiple abscess sacs in the uterus, pelvic cellular tissue, tubes, or peritoneum. These may cause general illness, often of a grave character, because of septic absorption from the infected areas. In selected cases of this kind, it may be necessary to remove the uterus, tubes, and ovaries and to drain the parametritic abscesses.

This is best done by the *vaginal route*, because shock is less than by the abdomen; and there is less danger of infecting the general peritoneal cavity. A good method is to open the anterior fornix of the vagina, to separate the bladder from vagina and cervix, and to enter the peritoneum between bladder and uterus. Then the posterior cul-de-sac is opened, and the anterior and posterior wounds in the vagina are united at the sides.

Strong vulsellas are fastened to the portio vaginalis on each side, and the cervix and uterus in turn are split by scissors both fore and aft from os to fundus. Hemorrhage is not great if the incision is in the median line of the uterus, and is entirely prevented by traction upon the vulsellas during the act of splitting. The uterus is turned out into the vagina in two halves, each attached by the broad and round ligament.

These attachments on each side are secured by mass sutures and each half is cut away in turn. The tubes and ovaries, if hopelessly diseased, can then be removed and abscess cavities in the lateral regions of the pelvic areolar tissue can be drained. The pelvic cavity is drained by a loose packing of gauze through the vaginal wound.

INFECTION OF THE FEMALE GENITALS (Cont'd)

SYPHILIS

Syphilis concerns the gynecologist in its general aspects and especially also in its relations to the essential sexual organs of woman. A consideration of the general subject of syphilis would be out of place here.

In women the genital organs affected with this disease are almost exclusively the external, although chancre of the cervix is occasionally seen. Syphilis of the uterus, tubes, or ovaries is very rare, and can hardly be distinguished from the manifestations of the disease elsewhere in the body.

The Primary Lesion

Chancre is the name applied to the primary lesion of syphilis. While many varieties of the initial lesion are described by syphilologists, there are really only three types which especially interest us as gynecologists. These are the moist papule, the dry scaling papule, and the indurated ulcer (true chancre).

The microbic cause of syphilis, the *spirocheta pallida*, enters the tissues only through some trauma, be it ever so slight. The germ may remain upon the surface until maceration of the epithelium or trauma later gives it a chance of entrance into the tissues. This little crack or excoriation in which the inoculation occurs soon heals without noticeable symptoms. From ten days to as many weeks, on the average forty-five days, afterwards a little papule appears at the site of the original lesion.

This little papule enlarges, but rarely attains a greater diameter than one centimeter. Its surface usually breaks down (necrobiosis) if the papule is located upon moist surfaces, and a little ulcer is left which secretes a cloudy serous discharge in small quantity. If on dry surfaces, such as the skin side of the labia majora, the superficial epithelium of the papule becomes sloughed off before very long, and

the lesion results in an ulcer or chancre, like the moist papule before described.

Usually, in women, the papular stage of the chancre is not observed, but attention may first be called to the initial ulcer. Because of the fact that pain and other marked symptoms are usually absent from the initial lesions, and because the chancre may remain unnoticed upon the female genitals, the diagnosis is not often made.

Induration is a marked characteristic of the initial lesion of syphilis. The base of the ulcer or papule is hard and feels, when one grasps the tissue around it, as if it were formed of parchment. In

Fig. 125.—Chancre of cervix. (From preparations in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

some cases, the tissues are indurated around the ulcer in a nodular form. The induration, as a rule, is less marked than in the male, and is frequently entirely absent.

Secondary and Tertiary Lesions

The later manifestations of syphilis, so-called secondary and tertiary lesions, appear in the external genitals of woman as mucous patches, condylomata, and tertiary ulcerations.

The mucous patches are found especially between the folds of the labia and on the vestibule. They appear, like such lesions elsewhere, as soft velvety areas on the mucous surface, covered in part by a soft whitish exudate. The area is slightly elevated above the general surface.

The condylomata are warty growths, due to hyperplasia of the papillary layers of the skin and vulvar mucous membrane, which

often rise above the surface as distinct papillomatous tumors. The flatter and less elevated ones are called *condylomata lata*. They often extend over considerable surfaces, especially in the labia minora and the inner surface of the labia majora.

The more pedunculated warty tumors are sometimes called *condy-*
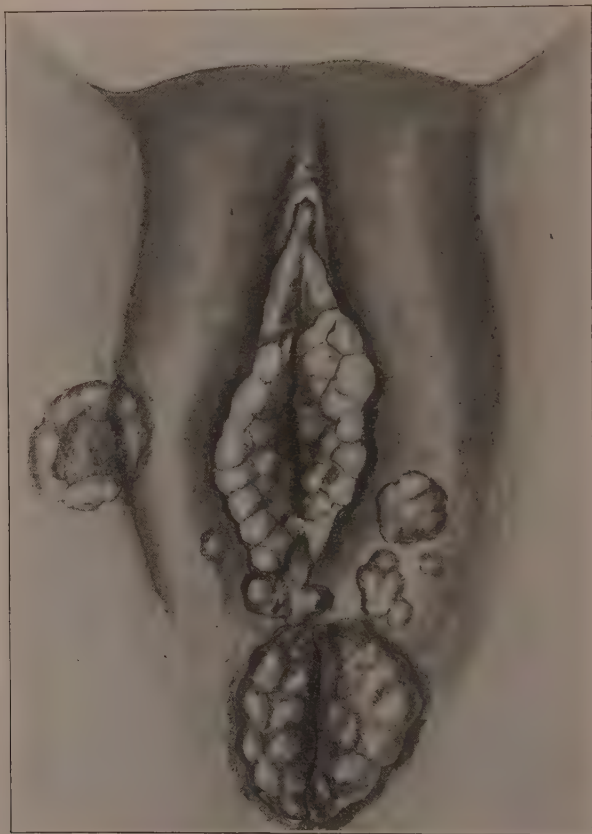
Fig. 126.—Condyloma lata.

lomata acuminata. They often rise high above the general surface, have a papillary appearance like cauliflower, and sometimes hang down between the thighs for an inch or more. In appearance, they do not differ materially from similar warty growths due to other causes, such as irritating discharges from gonorrhea or purulent

infection.   They often disappear under antisyphilitic treatment without operation, although they sometimes require surgery.

Tertiary ulcers of the vulva, vagina or portio resemble indolent ulcers from other infectious processes, especially tuberculosis.   They do not heal readily under any kind of local treatment, unless combined with general antiluetic measures.   The ulcers are extensive, sometimes involving a large proportion of the surface of the vulva or vaginal wall, they extend progressively, are paved with grayish unhealthy granulation tissue, and are covered with a dirty discharge. They often undergo hyperplasia and resemble carcinomatous growths, tuberculosis, or lupus.

Diagnosis

In the comparatively rare instance when the initial lesion is observed, the *presence of the spirocheta pallida* will confirm the diagnosis.   The surface of the chancre should be wiped free of the discharge, and the serum which later exudes should be smeared upon microscopic slides and examined for the microbe.   The detection of the spirocheta is not easy, and usually requires special training in bacteriological technic.

The germ is revealed by means of india ink.   This stains the tissues or the other elements of the smear black, and leaves the spirochete unstained.   The organism is very thin and about as long as a tubercle bacillus.   Its shape is that of a spiral.   In life it has motility.

The **Wassermann test** is of confirmatory value in the diagnosis of syphilis later than the initial stage.   It is uncommon for a positive Wassermann to be obtained within several weeks of the appearance of the primary sore.   It is of much corroborative value in cases of condylomata and of eroded areas of mucous membrane which resemble mucous patches.   It is not a crucial test like the demonstration of the bacillus, but has great diagnostic value, especially if repeated.

Unfortunately, it is modified by the usual treatment of syphilis, and that treatment has been instituted in most cases where the test is invoked.   The details of the Wassermann test belong to treatises on bacteriology.

The **therapeutic test** has been employed with considerable success as long as mercury and iodide have been used in the treatment of syphilis.   Even now, it will often happen that the laboratory tests

will not be available, and one must await the results of treatment before confirming his diagnosis. Therapeutic tests can be at the best only corroborative. Because a condition improves under the usual treatment for a given disease, we have no scientific right to assume that the diagnosis of the given disease is proved. So many conditions improve under so many different treatments, or even under no treatment at all, that such diagnostic evidence can only be presumptive.

Treatment

Local treatment of primary, secondary, or tertiary lesions of the female genitals resolves itself into attempts to keep the ulcers clean and as dry as possible. In other words, the same aseptic and antiseptic measure should be employed as for ulceration of any sort. In addition, mercurials should be used locally, such as black or yellow wash or calomel ointment.

If the lesions are not syphilitic, they will probably yield to the local treatment. If they are syphilitic, they may be prevented from becoming secondarily infected with other germs. Meanwhile, as soon as the diagnosis is probable, the general treatment for syphilis should be vigorously undertaken.

TUBERCULOSIS

Tuberculosis of the female genitals rarely, indeed almost never, occurs without tuberculosis elsewhere in the body. In over ninety per cent, the disease is also in the lungs; in sixty per cent it is also in the peritoneum; and in eleven per cent in the urinary system. The oldest manifestations of the disease are almost always in the lungs or in the mesenteric glands. Tuberculosis of the genitals occurs in about one and one-half per cent of all the cases of the disease in women.

Direct infection by way of the vulva and vagina has never been proved. In only very few cases has it seemed probable. The genitals usually become infected from the blood current, and probably in some instances by transmission of the infectious material into tubes and uterus from the peritoneum. It is also evident that frequently the infection of the peritoneum arises and is continued from the tubes.

Etiology and Pathology

The microbic cause of the disease is the *bacillus tuberculosis,* one of the germs first proved to be the cause of infectious diseases. It is a rod-shaped organism with rounded ends, and a slight curve, measures from 1.5 to 3.5 microns in length, and less than .5 microns in breadth. It is stained red by the anilin-fuchsin or phenol-fuchsin method of Ehrlich. It resists decolorizing by acids, and is thus differentiated from most other bacilli of like size and shape. In many instances the bacillus does not seem to require any demonstrable trauma in order to infect tissues. It seems to attack especially endothelium and columnar epithelium.

The *lesions* are similar to those elsewhere in the body. They result from the degeneration of the tubercle, a special form of granu-
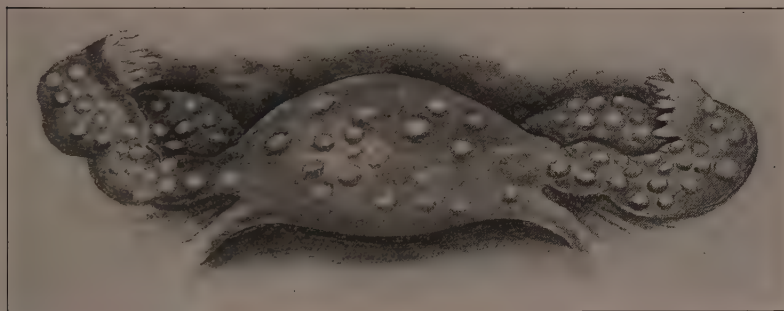
Fig. 127.—Tuberculosis of uterus, tubes, and ovaries.

loma representing the resistance of the tissues to the invasion of this bacillus. The tubercle represents the localization of the infection, as the papule, the mucous patch, and the gumma represent that of syphilis. The tubercles coalesce, degenerate, and spread. They form ulcerations upon mucous or cutaneous surfaces and creamy or cheesy collections within the substance of organs or tissues. There is a tendency for the latter collections to lose fluid by absorption and to become of a more hard caseous character, to become cicatricial, or even calcareous.

The creamy fluid resulting from the degeneration of tuberculous tissue contains much fatty matter, degenerated cells, particles of tissue, and some leucocytes. It is sometimes called *tubercular pus.* In cold abscesses it often becomes sterile.

In mucous membranes there is also what is called a *bacillary catarrh*. This seems to result from the infection of the mucous membrane with the bacilli, without the formation of definite tubercles. The mucous discharge is increased, is clouded with leucocytes, and contains abundant bacilli. The lumen of a hollow organ lined with mucous membrane may become filled with this fluid.

Tuberculosis of the Tubes.—When we come to consider the different genitals in connection with tuberculosis, we find that the tubes lead in frequency of infection. The disease causes thickening and torsion, with formation of creamy or cheesy contents. In about half of the cases, the abdominal ostium is found open. In many there are extensive adhesions of the tubes to surrounding organs and to each other. The process appears to be of greatest intensity at the infundibulum, while the uterine end is often free. When the ostium is closed, the distal end may distend considerably (tubercular sactosalpinx).

The mucosa is usually studded with tubercles which appear under the naked eye, as well as under the microscope. In many instances the mucous layer seems covered with a grayish coating, showing no typical tubercles even under the microscope, but the superficial layers desquamated, and necrotic, and with far more bacilli than in the nodular form. Sometimes there is only the bacillary catarrh, which is probably an early form.

Tuberculosis of the Uterus.—In the uterus one finds less often the nodular form but more often the necrotic endometritis similar to the necrotic salpingitis already described. Lymph channels through the muscular coat of the uterus become clogged with tubercular debris and bacilli. The disease, except in advanced cases, is usually confined to the corpus, leaving the cervix free. As in the tubes, the tuberculosis commonly takes its first seat in the superficial mucous layer surrounding the lumen. Bacillary catarrh is often observed.

Tuberculosis of the Vagina and Vulva.—This disease in this locality is rare and almost always secondary to the disease higher up. It is often observed in the form of indolent ulcers, resembling those of tertiary syphilis. Sometimes the tubercular process raises the mucous membrane of the vagina or vulva into papular elevations. In the ulcers the bacilli can often be demonstrated.

Tuberculosis of the Peritoneum.—In connection with the female genital organs, the disease is usually manifested by the presence of

miliary tubercles and larger tubercular masses upon the serous surfaces of the tubes, pelvic peritoneum, and uterus, sometimes on the ovaries. In the exudative variety there is considerable accumulation of fluid in the abdominal cavity. This fluid is a more or less cloudy serum in which the bacilli can seldom be demonstrated, but which is usually inoculable in guinea pigs. In the fibrinous forms there is a fibrinous layer over the peritoneal surface of the affected regions in the earlier stages, and adhesions of peritoneal surfaces in the later stages.

It is a moot question whether tuberculosis of the tubes is more often the cause of that of the peritoneum than vice versa. Tuberculosis of the peritoneum is far more common in females than in males, indeed nearly 90 per cent of the cases are in the former. There is no doubt that the infection often travels from the peritoneum into the tubes, and there causes a chronic destructive process.

There is also no doubt that often the process is first manifested in the tubes, perhaps arising from bacilli floating in the blood. In many instances the bacilli may gain access to the tubes from the cul-de-sac of Douglas, having gravitated there without visible infection of the peritoneal surface after having originally entered the abdominal cavity from tubercular lesions in the mesenteric glands, the intestinal tract, or the pleura. Often there will be found a chronic cheesy condition in the tubes or a tubercular sactosalpinx and evident new lesions in the adjacent peritoneum in the shape of miliary nodules dotting its surface. Often the fimbriated extremity of the tube is partly open, and tubercular pus enters directly into the peritoneal cavity.

It is very likely that the condition in the tubes often acts as a storehouse for continual reinfection of the peritoneum, even although the original infection of the tube may have come from the peritoneum itself. The anatomical condition of the tube, with its multitudinous folds covered with ciliated columnar epithelium and with the relatively scanty blood supply, tends to cause a localization in the tube and the maintenance of a chronic tuberculosis there.

Avenues of Entrance of Infection.—The possibility of infection from the *vagina and vulva* must be admitted, although that avenue is probably a rare one. Marital infection occurs very rarely by way of the genitals, but almost entirely by way of the usual avenues, notably the *mouth*.

From *neighboring anatomical structures* infection may spread to the genitals. In a few instances it may come from the lower bowel or the bladder, in more it is evidently from the peritoneum. In a few cases infection from the *placental site* seemed probable.

It seems pretty generally conceded that the usual method of infection of the female genitals is *hematogenous,* and that the bacilli enter the blood stream from some focus elsewhere, especially the lung. The first manifestation in the genital organs is usually in the tubes and here are found the oldest genital lesions. This is shown by their cheesy character, the great cicatrization around the deposits, and the rather frequent occurrence of calcareous formations. From the tubes the infection often extends in the direction of the flow of mucus into the uterus. Rarely does it pass the internal os.

Clinical Course

Studies of anatomical material have usually shown that tuberculosis of the female genitals is a disorder of minor grade as compared with tuberculosis of other parts of the body. Very seldom can the process in the genitals be said to have been the cause of death. So much more important clinically is the disease elsewhere that it is very rare in hospitals for subjects dead of tuberculosis to enter the dead house from the gynecological wards.

The diagnosis of tuberculosis of the genitals as such is seldom made before operation or autopsy. Its probability is heightened by the history or the demonstration of tuberculosis in the lung or other part of the body. The general symptoms of tuberculosis and the demonstration by gynecological examinations of pathological conditions in the pelvis will render the diagnosis probable.

When the general signs and symptoms of tuberculosis are very slight or absent, the operation is usually undertaken under the diagnosis of pyosalpinx, ovarian cyst, retroversion with adhesions, endometritis, or other morbid state of the genitals. When there is a discharge from the uterus or from the vagina in which the bacilli can be found, the diagnosis has more assurance; but this state of things is uncommon, indeed only observed in cases of discharge through the uterus from the open tubal orifices, from tubercular endometritis, and from tubercular ulceration in the vagina or vulva.

The diagnosis is most often *made at the operation,* when the nodules or the cheesy deposits are found. In operating for tubercular peri-

tonitis with effusion, the tubes are often found distended and the serous surfaces of the pelvic viscera studded with tubercular nodules.

The *tuberculin tests* are of the same value gynecologically as in testing for the disease in other parts of the body. They do not prove its localization in the genitals.

Prognosis

The prognosis of tuberculosis of the genitals is good in respect to life and depends upon the prognostic signs as observed in the general condition. As before intimated, *death is usually caused by the disease elsewhere,* although the existence of extensive lesions in the pelvic organs is a point weighing against the patient who is suffering from tuberculosis of the lung or other usually affected organ. In general the prognosis depends upon the patient's willingness or ability to undergo the hygienic treatment for the disease.

Treatment

In most textbooks, and in many journal articles even of recent date, more or less *radical operation* is recommended. August Martin, in 1908, advised curettage of tubercular ulcers of vulva and vagina and removal of internal genital organs which were hopelessly diseased. Many others recommend the removal of affected tubes, ovaries, and even the uterus when this can be done consistently with the general condition. Many do not consider even the existence of tubercular lesions elsewhere as sufficient contraindication to the operation.

On the other hand, there is marked tendency among progressive surgeons *not to operate* in tubercular disease except under very limited conditions. The fact that the primary mortality in operations upon tuberculous genitals is high (10 to 13 per cent), that the disease in the genitals is not in itself deadly, and that the primary focus is usually inaccessible, are points urged by conservatives. Operations are now rare on the tuberculous lung, bones, joints, kidneys, or bladder; indeed there is less operating on tubercular lymphatic glands of the neck.

The tendency in treatment of tuberculosis anywhere in the body is to employ rest, local and general, and the modern *hygienic* antituberculous methods. In general we may say that tuberculosis is a disease which tends to recovery when treated early by measures which have

for their object the keeping of the body in its highest state of nutrition.

Rest is an important item in the *modern treatment of tuberculosis.* Only the very minimum of exercise is permitted. Pleasant surroundings and congenial companions are essential. Nutrition is brought to its highest pitch by the use of the most easily digested and the most highly concentrated foods. Above all, *fresh air* is indispensable. Smoke, dust, and noxious vapors are avoided by treating the patients, as far as possible, in the country. In short, everything is done to preserve what strength and vitality the patient already possesses, and to enable her body to accumulate more and more.

Points Against Operation.—Operation is necessarily accompanied by shock, irritating effects of ether, inhalation of buccal and nasal fluids with the deep breaths of the anesthetic coma, nausea and other digestive disturbances for days afterwards. The loss of blood, the necessary diminution in the ingestion of food, the depressing effects of hospital life, and the lack of fresh pure air are all further handicaps inseparable from any operation. All these things are bad for a patient suffering from tuberculosis and all are antagonistic to the general trend of modern treatment for the disease.

In favor of operating there is also something to say. It is a matter of wide experience that tubercular peritonitis may often be cured by incision or drainage of the abdomen. A large number of such cases are probably caused by tuberculosis of the tubes. Often the diagnosis of tubercular infection of the female pelvic organs is made at the time of the laparotomy. Therefore, with the abdomen already opened, it is proper to remove evidently tubercular tubes, provided that such removal is not likely to be extremely difficult and time-consuming.

This admission does not imply that a tubercular uterus should be removed. The uterus is not the continual feeder of tuberculosis to the peritoneum which the tube is and furthermore, hysterectomy, even under the most favorable circumstances, is much more severe upon the patient than salpingectomy. It also opens up far more vascular and lymphatic channels to extension of the infection.

There is little reason in subjecting the patient to the dangers of operation in order to remove organs which are usually only a secondary feature in the tuberculosis from which she is suffering. Genital

tuberculosis is seldom or never the direct cause of death. The removal of these organs can very rarely remove all or even a large part of the tuberculosis in the body, while it always opens up the chance of spreading the infection from the genital focus by way of the blood and lymph streams.

DERMATOLOGICAL INFECTIONS

Since the external genitals are covered by true skin on the exposed surfaces and a modified integument, incorrectly called mucous membrane, on the protected surfaces, and since the vagina is lined with a similar modified membrane, it follows that diseases of the skin may affect them. The appearances are similar to those of skin disease elsewhere, and the same principles of pathology and therapeutics apply.

The peculiarities of the integumentary structures of the genitals in respect to the presence of *irritation* act as factors in the production of dermatological disorders and in the treatment of them. Urine, smegma, leucorrhea, the menstrual blood, sweat, and other easily decomposable material may remain on the external skin or within the numerous folds of the vulva to act as irritants and as culture media for bacteria.

Fat women, pregnant women, those suffering from vaginal discharges, diabetics, and dirty women are more prone to these disorders than others. Extended exposition of this subject must be left for treatises on dermatology, but it is proper here to consider briefly some of the commoner disorders of the skin which confront the gynecologist.

Chancroid—Soft Chancre

The results of chancroidal infection, which is now considered to be specific and due to the Ducrey bacillus, are seen on the female genitals more often than chancre. The specific bacillus is not easily isolated from the multitude of others which are found in smears from chancroidal pus, and its detection will usually require a trained bacteriologist, but it has been pretty well proved to be the specific agent Except in the earliest stages, when it is seldom seen, *the lesion is a true ulcer,* with sharp punched out edges, sometimes undermined, a soft granular base, and a purulent discharge.

It is *caused by infection* from the pus of another chancroidal infection; almost always results from coitus; is autoinoculable, and therefore tends to spread. The ulceration begins at some point on the vulvar surface, requires a previous trauma, however slight, and extends rapidly.

Surfaces opposed to the original ulcer become infected with the virus as the epithelium becomes macerated by the discharges. Sometimes the ulceration spreads to the skin of the thighs or even the abdomen, either by destructive extension of the ulcer, or by autoinoculation. When the spreading is extremely rapid and destructive, the chancroid is said to be phagedenic. Phagedena implies either an excessive virulence of the infection, or a minimum resistance of the tissues.

Diagnosis is made from the sharp outline of the ulcer, its rather rapid extension, its facility of inoculating tissues in contact with it or its discharges, its soft base, and its appearance within a day or two after exposure. There is usually considerable pain which often serves to distinguish it from true chancre. When Ducrey's bacillus can be demonstrated, we have a specific sign.

In case of doubt, it is permissible to make a small scratch elsewhere on the patient and *inoculate* with pus from the ulcer. If chancroidal, a new chancroid will soon result at the point of inoculation. If simple ulceration, due to the commoner septic microbes, the process of formation of another ulcer will be slow, and if syphilitic, there will be no new inoculation of chancre. Chancre will also be distinguished by the presence of the spirocheta.

Chancroid is characterized by rapid extension of the infection to the inguinal lymph glands, where *the chancroidal bubo* is formed. The glands swell, become inflamed and tender, suppurate, and at last may rupture. The resulting ulcers are themselves chancroids.

Prognosis is not so good in women as in men because of the greater difficulty in keeping the parts clean, and the unfavorable influence of urine and discharges. Chancroid is more apt to occur, indeed, in uncleanly persons. It is likely to be more severe and prolonged in such.

Treatment is summed up in cleanliness and antisepsis. As soon as the ulcer is noticed, all the external genitals should be thoroughly washed in soap and water, in alcohol, and in bichloride solution.

Peroxide of hydrogen is often useful in cleaning up the floors of the ulcers. To be effective the cleansing process should be repeated every few hours, and meantime the parts should be well covered with gauze dressings. The dressings should be placed also between the folds of the vulva so as to absorb the pus.

In some cases *cauterization* is necessary. After cocainization of the floor of the ulcer, it should be swabbed with carbolic acid 95 per cent. This should then be neutralized with alcohol. Afterwards the ulcer may be painted with 2 per cent silver nitrate and then dressed with gauze or cotton. The cleaning should be repeated in a few hours, and the silver solution applied again, but usually one application of the caustic will suffice.

Suppurating buboes should be opened and then the abscess cavity should be treated like the original chancroid. If seen before suppuration is well advanced, the bubo may be excised. As the infectious microbes are mostly in the pus cells or in the most superficial granulating layers, the glands can often be dissected out without causing infection of the wound, which may safely be sutured. If treatment is begun early, before the bubo has begun, and carried out as described above, the formation of bubo can usually be prevented.

Intertrigo

Intertrigo is *caused by maceration* of the skin between folds in the regions about the vulva. Therefore it is more common in fat women. The sweat, sebum, urine, and discharges from the vagina become decomposed by the mixed microbic flora of the parts and, as irritants, cause hyperemia of the skin and loss of its superficial cells. It is commonest, and reaches its maximum of disturbance in fat *diabetic* women, in the ample folds of whose groins and genitals the saccharine urine creates the maximum of irritation.

The symptoms are intolerable itching and burning, redness and maceration of the skin surface between folds, often the presence of a serous or seropurulent exudate.

Treatment consists in cleanliness and dryness. Washes of solutions of bicarbonate of sodium, mopping the affected parts dry with cotton or very soft gauze, dusting with a bland antiseptic powder, and separation of the folds by strips of gauze or cotton are the essentials. The cleaning, drying, and dressing must be repeated several

times a day. Perfect rest on the part of the patient makes the treatment much easier.

Eczema

Acute eczema may sometimes affect the vulva and the vagina as well. There is intense burning and itching with a diffuse redness and swelling of the parts involved. Later small vesicles rise up and break. Thus arises a serous discharge or "weeping."

The *chronic forms of eczema* are more common in the female genitals. Erythema, squamous eruption, infiltration of the skin, and often the production of nodules are characteristic.

The general causes are the same as for the disease elsewhere, namely, disturbances of nutrition, disorders of the digestive tract, and acidemia. The *local cause* is usually irritation from acrid discharges, decomposing blood and mucus, and saccharine urine. After the menopause, the local atrophic changes which occur predispose to irritation of the skin, and so eczema is fairly frequent at that period.

The treatment in general should include a simple but full diet, without alcoholics, spices, tea, and coffee. In the acute forms the local treatment should be sedative. The use of astringent washes and douches, such as lead and opium wash, is recommended. Oxide of zinc ointment or other bland unguent should be applied after the wash has been mopped away. When the itching is intolerable, it is permissible to apply three to five per cent carbolic acid, which should be washed away in a few minutes.

Ichthyol is a remedy of great value in eczema of the vulva and vagina. It may be applied in ten per cent solution with glycerine on a tampon or, for the vulva, with vaseline in the same strength as an ointment. In both instances the ichthyol should remain in contact with the parts for several hours. In eczema water should not long be in contact with the affected skin. In some chronic scaling cases, a tar ointment may be useful as a stimulant. Naphthalan paste has been recommended.

Herpes

Herpes progenitalis resembles herpes of the lip or other locality, and is due to similar causes, notably neurotic. The vesicles appear in little bunches on a reddened base. There is usually much pain and

tenderness. When the vesicles rupture, a superficial ulcer remains for a few days. The disorder is self-limited and recovers in a few days or a week. The ruptured vesicles should be kept dry with dusting powder, and protected from rubbing by shreds of cotton or strips of soft gauze.

Pediculosis Pubis

The pediculus pubis or crab-louse is a small inactive animal which clings tightly to the pubic hairs near the roots. It resembles a small scale, yellowish in the nonpregnant state, but darker when the animal is filled with eggs. It reaches the body of the affected individual from that of another, usually at the time of coitus. Its eggs
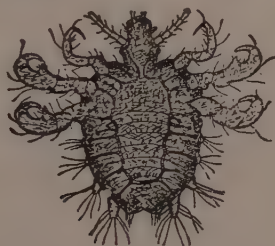
Fig. 128.—The pediculus pubis, magnified. (Stelwagon—*Essentials of Skin Diseases*.)

or nits are deposited and fastened to the hairs like those of the head louse.

When a crab-louse is picked off and placed on its back its legs and claws can be seen to move. It has small speed of locomotion. The presence of the parasite is usually made known to the host by the itching which it causes. The skin is very little changed unless by the traumatism due to too vigorous scratching.

The treatment consists of rubbing blue ointment or oleate of mercury well into the hairs and skin and leaving it on for a day. This application of ointment should be repeated in four or five days to kill the lice which may hatch out from the nits. If no nits are found on very careful examination at the first time of using the ointment, a second application will not be needed. It is seldom necessary to shave the pubes.

CHAPTER XIV

NEOPLASMS

Definition.—The term neoplasm means new growth. The term tumor means a swelling or enlargement. In the beginning at least every neoplasm causes an enlargement, therefore is a tumor. Later, ulceration may cause loss of tissue so that there is a decrease in the amount of tissue in the affected locality. Inflammatory swellings, abscesses, hematomata, traumatic exudates, and even retention cysts, while they cause swelling or tumor, are not new growths. The terms neoplasm and tumor, however, are frequently used synonymously.

Etiology.—The Cohnheim theory of neoplasms has long been considered the best explanation of their phenomena and their appearances. This theory maintains that certain small groups of embryonal cells become displaced in early embryonic life and later, because of irritation of some sort, proliferate and form neoplasms. This theory seems plausible for the teratoid tumors, such as the teratomata and the embryomata, but less plausible for the destructive malignant ones, such as the cancers. It surely fails in the case of the tumor-like granulomata, such as are observed in tuberculosis and syphilis.

Why do fibroid tumors appear in the uteri of middle-aged women and more frequently in nulliparæ than in multiparæ? Why do carcinomatous growths appear in the breasts and cervices of multiparous women more often than in virgins? Why does carcinoma of the body of the uterus appear most often in nulliparous women? Why do dermoid cysts sometimes increase, in a relatively short time, from a minute size to that of a fetal head? For the present these questions can not be definitely answered. The ultimate causes of neoplasms are still obscure, although we have learned much about some of the predisposing and exciting causes.

Classification.—Neoplasms are classified according to the embryonic layer from which they arise. From the ectoderm arise the epitheliomata, the squamous-celled cancers and the nonmalignant warty growths. From the entoderm arise the glandular tumors of

the alimentary and respiratory tracts, the benign and malignant adenomata. From the mesoderm arise a great variety of tumors; the fibromata, the myomata, the sarcomata, the osseous and cartilaginous tumors, and the glandular neoplasms of the urinary and genital tracts.

Tumors are also classified as benign and as malignant. A *benign neoplasm* does not invade surrounding structures with its proliferating cells, as a rule grows slowly, does not send out prolongations, does not destroy surrounding tissues except by pressure, and does not form metastases. A benign tumor has its blood vessels incorporated with it, and therefore seldom ulcerates except when it presses against hard tissues or when it becomes infected.

Its cells do not show very rapid proliferation. Giant cells are uncommon. A benign glandular tumor does not show several rows of epithelial cells around the lumen or at the periphery of papillæ. The sections between glandular lumens show a considerable amount of interglandular connective tissue, and the epithelium does not stand back-to-back with almost no intervention of connective tissue. When removed, these neoplasms exhibit no tendency to recurrence.

A *malignant neoplasm* shows actively proliferating cells which invade surrounding structures and are not limited by basement membranes or by capsules. The tumors do not carry supplying blood vessels and consequently soon show necrosis in the centers of the lobules. The active metabolism of their cells seems to cause them to excrete toxic bodies which induce a local reaction and local leucocytosis. The active cells stain deeply and show signs of extreme vitality. Giant cells are often found. Malignant glandular neoplasms show a marked back-to-back arrangement and several layers of epithelium. It is difficult to remove them completely, and they show a marked tendency to recurrence.

METASTASIS

Malignant tumors extend between aponeurotic layers, and even through them. The cells break into lymph channels, where they may proliferate; and also into blood vessels, where they are likely to be destroyed. Therefore, metastasis takes place. The term means appearance in another place.

Metastasis means the appearance of a tumor of similar structure at some distance from the original growth. *Local metastasis* follows along the neighboring lymph channels, especially those which drain the affected part. The malignant cells are lodged in the lymph glands and, proliferating, destroy the glands and form a secondary malignant tumor.

General metastasis also usually follows the *lymph channels*. The malignant cells grow slowly along the lymphatics, progressively and centrifugally in continuity with the primary growth, and often independently of the direction of the blood and lymph streams. The neoplastic cells follow the lines of least resistance to their extension, and therefore grow along the lymph channels in all direc-
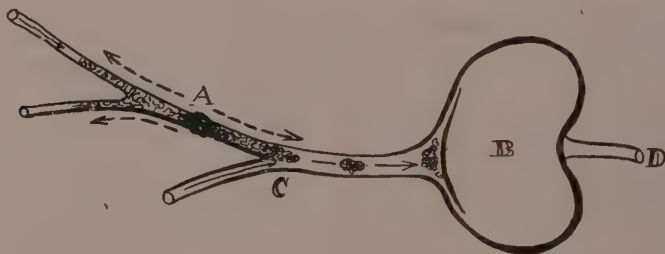
Fig. 129.—Diagram showing cancerous permeation of lymphatics. *A*, starting point of cancer; *B*, lymph node; *A*, proliferation extends along lymphatic to *C*, particles of tissue may be broken off and carried along lymph stream to node where they ultimately proliferate. Straight arrows indicate direction of lymph stream, dotted arrows, direction of epithelial permeation.

tions. As the growth or permeation extends from a small to a larger lymph vessel, particles of cancerous tissue may be broken off and carried by the lymph stream to the nearest lymph node.

The lymph node at first acts not only as a mechanical filter to prevent extension of the cancer, but for a time at least seems to exert a destructive action on the cancer cells. It seems to succumb to the invasion only after a prolonged resistance. After the node is successfully invaded, it becomes a center from which the surrounding tissues may become infiltrated with the malignant cells. This permeation of the lymph channels and lymph nodes may be very extensive and reach to points in the body far distant from the original neoplasm. It is even considered by Haidenhain and others that all metastasis develops according to the lymphatic method.

There is still strong reason to believe that metastasis may occur

through the medium of the *blood stream*, although it is generally admitted that such an avenue of extension is far less frequent than the one by way of the lymphatic system. It is true that experiments have shown that cells from malignant growths, introduced into the blood stream, are usually destroyed therein. On the other hand, it is difficult to explain the very remote metastases, which occasionally are observed, on any other basis than that they reached the metastatic region through the blood.

The cells of the neoplasms may reach the blood in two ways. They may break through the walls of the capillaries and venules, or they may reach the blood stream by way of the hemolymph glands. The latter glands are found along the lymphatic chains. Within them the blood spaces of the capillaries unite with the minute lymph spaces so that a mixture of blood and lymph takes place. Some cells, traveling along the lymph channels like emboli, may reach these hemolymph glands and there find direct entrance into the capillaries, succeeding in overcoming the cytolytic action of the blood long enough to enable them to reach their destination in some distant and minute capillary. Here the little cancerous embolus may lodge and set up a secondary growth. It is likely that sarcoma is more often transmitted by the blood stream than is carcinoma.

CARCINOMA

Pathology

Carcinoma is a malignant neoplasm composed of epithelial cells arranged more or less like a caricature of glandular structure. Carcinoma may arise from ectodermic or entodermic epithelium or from the epithelial elements of the mesodermic organs and tissues. There is always something of the picture of glandular structure, although often much distorted. If the gland grows downwards into the body of the organ, the adenoma results, which may be benign or malignant. If the gland grows outwards into the lumen or into the outside world, the papilloma results, benign or malignant. As a rule, the more malignant the carcinoma, the more irregular the glandular resemblance.

Sometimes recurrence after removal is the only criterion by which to judge whether an adenoma is benign or malignant. Usually the characteristics of malignancy are more marked, such as exuberant

and unrestrained growth into surrounding tissues, reduplications of layers of epithelium, evidences of rapid proliferation, and metastasis.

Even in the cuboidal-celled carcinomata and the squamous-celled epitheliomata there is a tendency to a rude glandular formation. The so-called nests of cancer cells, the alveoli, seen in microscopic specimens of carcinoma, represent cross sections of the finger-like prolongations of the distorted glands. In the adenomatous variety, the carcinoma has real glandular tubules with lumina. The reduplication of the epithelium of these glandular tubules and consequent formation of several layers of epithelium cause encroachment upon the lumina. In the alveolar types of carcinoma, the lumina have been lost and the glandular tubules are represented by the finger-like prolongations.

As in glands so in carcinomata, there is a *stroma* between the epithelial alveoli. This stroma is composed of connective tissue in varying amount and varying density. Where the stroma is dense or relatively more abundant than the cellular elements, the cancerous tumor is hard in consistency. This form of carcinoma is sometimes called *scirrhus,* meaning hard. Where the epithelial elements are relatively more abundant than the stroma, the tumor is soft in consistency. This form of carcinoma is sometimes called *encephaloid* or *medullary* cancer, meaning that it is soft like brain or spinal cord. These terms are old, handed down from former generations, but are still often employed. The terms hard and soft would be shorter and more intelligible.

Carcinoma is known histologically by the appearance of its tissue in general. The epithelial cells which compose its alveoli do not differ individually as far as we can perceive from normal epithelial cells. Therefore there is not yet demonstrable such a thing as a *cancer cell*.

The term *cancer* is used somewhat loosely to denote any malignant new growth and in that sense includes sarcoma. Since the great majority of malignant neoplasms are carcinomata, the term cancer is often applied to them. The word cancer is the Latin for crab (Krebs in German). The prolongations into the surrounding tissues are supposed to resemble the claws of the crustacean. An old superstition, which still survives among the ignorant, is that cancer can be cured by fastening a live crab to the body near the tumor and keeping it there until it dies.

With our present limited knowledge of carcinoma and of malignancy in general, we are compelled to classify carcinomata according to their histological appearances, that is, according to the kind
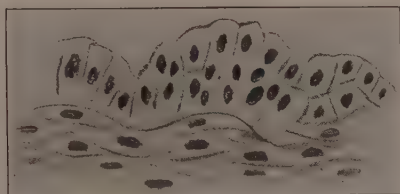
Fig. 130.—Type of cells in epithelioma of cervix.

Fig. 131.—Epithelioma of cervix.

of tissues of which they are composed. This is necessary until a good etiological classification is possible.

Epithelioma.—Carcinoma arising from the epidermis and from tissues which resemble it, such as the mucous membrane of the vulva,

vagina, and portio vaginalis, is composed of so-called squamous-celled epithelium like that of the skin. Around the periphery of an alveolus are found cuboidal or short columnar cells resembling the lowest layer of the rete mucosum of the skin. Towards the center, the cells become more and more flattened like the more superficial
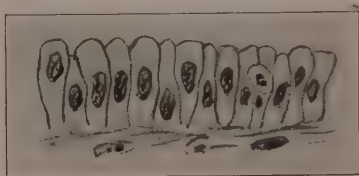
Fig. 132.—Type of cells in adenocarcinoma of uterus.

layers of the skin, and in the center may often be seen as flat devitalized scales resembling the scurf layer of the skin.

The cells are most vital towards the periphery, and therefore take stains best there, while the density of the stain diminishes towards the center of the alveolus which may be almost stainless. The
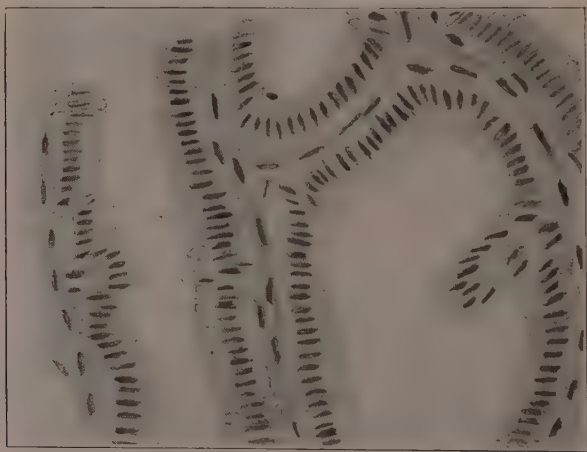
Fig. 133.—Adenocarcinoma of uterus.

growth of the alveolus and the pressure of the stroma upon it cause the squamous cells in the center to be squeezed into pearly nodules. These are sometimes called cancer pearls.

The variety of carcinoma described above is called epithelioma. In

the female genitals it is primary in the integument of the labia and vulva, and in the skin-like mucous membrane of the vagina and of the portio vaginalis. It also occurs in the breast, usually arising from the skin of the nipple and areola. It is of slower growth in the true skin than in the membranes lining the female genital passages. In the portio vaginalis it receives an abundant food supply and lies adjacent to an enormous swamp of lymphatics, consequently it is very malignant there.

Adenocarcinoma.—Carcinoma arising from glandular structures

Fig. 134.—Adenocarcinoma of endocervix.

is called adenocarcinoma. In its structure it resembles that of the glands in the region wherein it originates. The more it takes on the characteristics of malignancy, the less does it adhere to the glandular appearance. In the female genitals it occurs chiefly in the mucous membrane of the uterine cavity. It represents a hyperplasia of the uterine glands ''gone mad.''

True adenoma of the uterus, uterine mucous polyp and so-called hyperplastic endometritis represent localized hyperplastic growth

within benign limits. The line of demarcation between benign and malignant adenoma is indefinite, even to the microscopist. The growth of adenocarcinoma may be downwards into the submucous tissues or outwards into the lumen.

The epithelial elements composing the typical adenocarcinoma are columnar cells derived from the mucous membrane of the organ involved. When, however, the reduplication of the cell layers and the devastation of the surrounding tissues become marked, the cells of
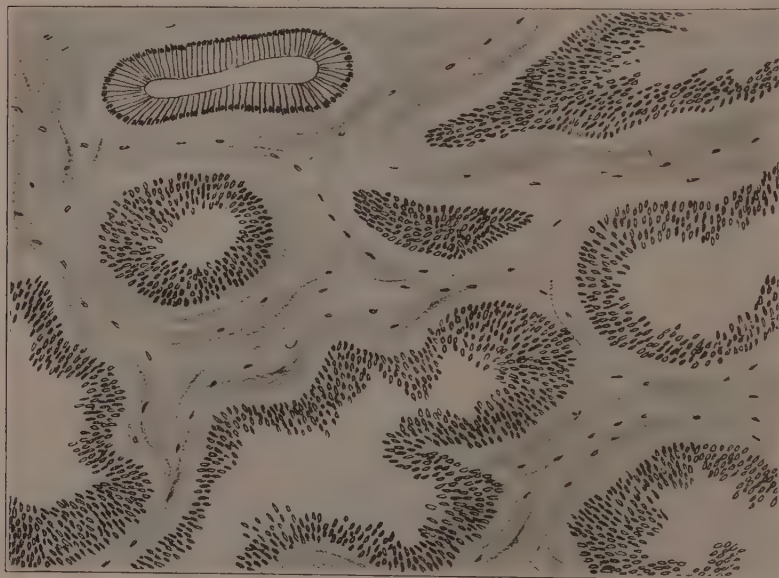
Fig. 135.—Adenocarcinoma of cervix.

the neoplasm change into a shorter columnar form or even into cuboidal or polygonal shape.

Cuboidal Carcinoma.—For convenience, therefore, we must make another general class of carcinomata, the cuboidal-celled carcinoma. In this form the glandular tubules are represented by solid columns of polygonal cells extending irregularly in all directions, but chiefly in the lines of least resistance along lymph channels between aponeurotic structures. Unlike the epithelioma, this form of carcinoma does not show pearls within its alveoli. The central cells of these alveoli, however, are not as well nourished as those of the periphery, and therefore take a less intense stain.

The carcinomata of the canal of the cervix uteri are originally adenocarcinomata arising from the glandular structures of the cervix, but soon take on the appearance of the cuboidal-celled variety. This form of carcinoma of the cervix is probably the most malignant form of neoplasm which affects the female genitals. Adenocarcinoma of the breast, arising from the epithelium of the glandular lobules and the milk ducts, frequently assumes the cuboidal-celled form.

Etiology

In addition to the actual but as yet unknown cause which produces carcinoma, there are several factors which seem to have a predisposing influence. These are age, race, heredity, and long continued irritation.

Age.—Carcinoma is rare in women under thirty-five, and over seventy. Sarcoma is the malignant neoplasm of youth and early adult age. The commonest age for carcinoma to appear in the genitals or breasts of women is between forty and fifty-five. Carcinoma of the cervix or of the breast is to be expected in the earlier, and carcinoma of the corpus uteri and external genitals in the later part of this cancer period.

Race.—Carcinoma is slightly more prevalent in this country among foreign born than among natives. Negro blood has long been thought to confer some immunity, but Cullen found that the disease was almost as common among negroes as others. In the Jewish centers in Europe, women of that race seem to enjoy no immunity to carcinoma, although Boldt, in New York, found that the disease was far less prevalent among them than among Gentiles.

Heredity.—Carcinoma is so prevalent that few families fail to find numerous cases in the last few generations. There are many striking examples which are often cited to prove the influence of heredity. Broca reports the instance of Mme. Z.; fourteen of whose nineteen female and one of seven male descendants died of the disease. Napoleon, his father, one brother, and two sisters, all died of it. In any large series of cases, however, the percentage is very small where a definite heredity can be traced.

In this connection the experimental work of Dr. Slye, of the University of Chicago, is interesting. The mouse breeds many generations in a year, and therefore is a convenient animal in which to study heredity. Dr. Slye has for several years bred mice for the pur-

pose of studying their hereditary tendencies in the matter of cancer. She has bred from parents one of which had cancer and found that there was a constant strain of mice arriving at cancer age which developed the disease.

She also bred particularly from the cancerous mice and obtained strains which had cancer in nearly every instance. She also bred noncancerous mice, the progeny of the cancerous mice which did not develop cancer themselves. After several generations, she was able to have a strain which had eliminated the cancerous heredity.

In other words, when she bred from one generation to another, starting from the same progenitors, she was able to breed a race of cancerous mice or mice immune to cancer, as she selected for mating mice which had the cancerous taint or those which were in process of eliminating it. These experiments are so far the best arguments in favor of a heredity factor in the etiology of cancer ever brought forward.

Local Irritations.—Continuous local irritation seems to have a considerable causal relation to the appearance of carcinoma in the female genitals and elsewhere. This is especially true of epithelioma. Squamous-celled carcinoma of the breast, starting at the nipple, often appears in women who have suffered from fissures and other traumatisms during lactation, or who have allowed the nipples to be pressed upon by snug or coarse clothing. Chimneysweeps' cancer was a disease often observed in men plying that trade, and may have been in some causal relation to the irritation from the soot and the traumatism incident to crawling through flues.

The *traumatisms and lacerations of the cervix* due to labors and abortions seem to be etiological factors in the production of carcinoma of the cervix uteri. Cancer in this region is seldom observed among women who have never borne children. Those who have had severe lacerations followed by much cicatricial formation and hypertrophy of the cervix seem most liable to the disease.

Indeed, some pathologists recognize a *precancerous stage* in specimens of such tissues removed for examination. This precancerous stage is marked by a large amount of fibrous tissue in the cervix, presence of many leucocytes within the meshes, and epithelial hyperplasia of the neighboring mucous membrane.

The *lysin theory* has been advanced, especially in connection with chorioepithelioma. It is based on Ehrlich's side chain theory. The

organism normally has the power to produce antibodies which prevent the proliferation of the embryonal remnants of Cohnheim. When the production of these antibodies fails, or is scanty, proliferation results, starting the malignant neoplasm.

Buxbaum, of Chicago, has studied a *microbe* of the torula class which he believes to be the cause of malignant neoplasms. He has found it present in many cancerous tumors and has succeeded in obtaining pure cultures. He claims to have produced carcinoma and sarcoma in mice by inoculation with these cultures.

Frequency

The statistics of the Illinois State Board of Health show a constantly increasing death rate from carcinoma. In 1902, one death in every twenty-four was due to the disease; in 1903 and 1904, one in twenty-two; 1905, one in twenty-one; 1906 and 1907, one in twenty; 1908 to 1911, one in nineteen. The number of deaths from carcinoma in persons over fifty years of age is increasing. The increasing mortality rate of carcinoma coincides rather closely with the diminishing rate of tuberculosis, typhoid, smallpox, and other infectious diseases. As sanitation saves from these diseases of early life, it leaves more people to die of carcinoma in later life.

From an analysis of the statistics of the Registrar-General's office in England, Roger Williams found that one of every twenty-one males, and one of every twelve females, who had reached the age of thirty-five, died eventually of cancer.

According to the Tenth Census of the United States, of the total female mortality from cancer, 33 per cent was due to carcinoma of the uterus, and 23 per cent to that of the breast.

Symptoms and Diagnosis

In the earlier stages the signs and symptoms of carcinoma anywhere are unfortunately little marked. Indeed it often happens that the first symptom to appear to the notice of physician or patient is one denoting a late and, therefore, a probably incurable stage. Epithelioma of the breast or of the integument of the vulva usually shows earlier than the internal carcinomata, because the localities are under frequent observation.

The first symptom of such *superficial cancers* will be the appearance of a hard nodule in the skin or close underneath. Pain is

caused by pressure of the tumor upon nerves or by nerve filaments being caught within the tissues of the tumor. It is, therefore, not one of the earliest signs. The indurated nodule will be found adherent to surrounding and deeper structures. There may be a tender surrounding area which may be hyperemic.

The nodule will grow outwards, invading the surrounding skin, and will extend deeper beneath it. The surface will become warty in appearance, slightly reddened or pigmented. Later the center will begin to ulcerate, and discharge serous fluid, pus, or blood.

The symptoms before ulceration are seldom observed in *carcinomata of the internal genital organs*. At this early stage, pain and tenderness are usually not marked enough to cause much annoyance. The tumor is not large enough to cause pressure symptoms.

In these localities *hemorrhage* is commonly the first sign observed. Slight spotting after coitus or after the douche may be all at first. The menstrual bleeding may be increased and the flow prolonged. There may be intermenstrual hemorrhages of varying degrees of severity. Any such irregularities in a woman of cancer age should lead the practitioner to demand examination. Such examination may reveal the individual organ affected.

After hemorrhage there is usually a slight *flow of serum* from the site of the hemorrhage. This serum may very easily become infected by putrefactive microbes, and therefore cause an odor. Often a foul serous discharge from the vagina is the first symptom of carcinoma of the internal passages. A foul purulent discharge is usually a symptom of the later ulcerating stage.

Excessive hemorrhages, excessive discharge, passage of necrotic shreds, great pain, bladder or rectal symptoms, cachexia, anemia, loss of weight, and such symptoms denote considerable development of the neoplasm, or ulceration of marked extent—all are symptoms of stages beyond incipiency.

When examination is made and a suspicious area is felt or seen, a *portion should be removed* by knife, scissors, or curette and subjected to microscopic examination. In doubtful cases it may be necessary to run the specimen through the various histological processes for the purpose of hardening and embedding, but usually immediate cutting by the freezing microtome and immediate staining will reveal the character of the disease.

If the quick method is negative, then the specimen may be subjected to the longer course. In every case of suspicion the burden of proof is upon the negative side. Any suspicious tissue should be regarded as carcinomatous until it is proved, to the satisfaction of a competent pathological histologist and the clinician, that the disease is benign. It is better for a woman to lose her noncancerous uterus, usually of no functional value at the cancer age, than to run the fatal risks of delay.

The *Abderhalden test* for carcinoma is based upon the same principles as his test for pregnancy. It depends upon the reaction of the patient's serum, dialyzed with boiled extract of a known carcinoma, with ninhydrin. If the peptone from the carcinoma extract is split by the serum, after being dialyzed with it for a considerable time, a reddish color appears on the addition of a one per cent ninhydrin solution.

As in the Abderhalden test for pregnancy, that for carcinoma depends upon absolute correctness in the whole course of the technic. The test is difficult and demands special skill and equipment. As yet its value is not generally conceded to be as great as the originators had hoped. It may have a confirmatory use or a corroborative value as one item in the diagnosis of an individual case. One would not yet feel like advising a radical operation on the testimony of this test alone, if positive, nor of refraining from advising operation, in the presence of other suspicious signs, if negative.

Prognosis

The *prognosis as to life* of any kind of carcinoma anywhere is of the gravest type. Almost never is there a tendency to healing. The disease progresses steadily and usually rapidly in the original locality, extends by lymph channels to neighboring regions, and by the lymph or blood stream to distant parts. Death commonly occurs in from one to four years after the recognition of the disease. In different localities and with different histological forms of carcinoma, the rate of progression differs. Adenocarcinoma of the breast and any carcinoma of the cervix and uterus may be expected to prove fatal within two years. Epithelioma of the nipple, skin of the breast, or of the vulva may last a year or two longer.

Recurrence.—By recurrence we mean the appearance after operation of carcinoma in places where it was not recognized before.

There may be *local recurrence;* reappearance in the scar or in the apparently healthy neighboring tissue. There may be *lymphatic recurrence;* reappearance in lymphatic areas draining the former site of the cancer or the extended field of the operation. There may be *general metastatic recurrence;* reappearance of neoplasm of the same histological character in other parts of the body.

Recurrence after operation depends so much upon the special anatomical characters of the different organs involved and the consequent differences in operative difficulty, lymphatic supply, and blood supply that the question of percentages must be left for the consideration of the disease as it appears in the various organs.

Treatment

In the present state of our knowledge of carcinoma, only *complete destruction of the carcinomatous tissue* can effect a cure. No certain method of destruction of such tissue is known except complete removal of every bit of it. This removal can only be accomplished by early and radical operation. The excision of the original tumor must include much of the surrounding healthy tissues to be sure of getting all of the neoplasm.

Extensive and complete dissection with removal of every possible lymphatic gland in the regions which drain the locality of the tumor must be included in the operation. The indication for operation and the discussion of the technical procedures belong to the consideration of the different organs and parts affected with carcinoma.

While, with our present knowledge and experience, early operation must remain the first and most important factor in rational treatment of carcinoma, there are other methods of treatment which demand consideration.

Medical treatment may, in the future, become the only method of combating the disease. Serums, vaccines, antidotes of any kind, or some new thing as yet undiscovered may be the accepted means. Hope seems to lie in that direction, but, at the moment of writing, medical treatment can only be deemed valuable for palliation in inoperable cases.

Caustic pastes may be dismissed from modern treatment.

Actual cautery, or ignipuncture, may be useful in limiting exuberant overgrowth as a preliminary to radical operation or in removing ulcerating and infected masses of an inoperable cancer. They

have no place in therapy with any well grounded hope of radical cure.

Radiotherapy, the x-ray, radium, mesothorium, etc., are now strongly advocated by many enthusiasts, not only as palliative treatment in inoperable cases, but also by some as radically curative treatment. Epithelioma of the skin and of the dermo-mucous margins has undoubtedly recovered under radial therapy. Few would advocate it for carcinoma of the nipple or glandular tissue of the breast, or for carcinoma of the internal genitals.

The value of radial treatment at present lies in its use as a palliative in cases which have recurred after operation, in cases where there remains suspicion after operation that all of the neoplasm has not been removed, and in cases deemed inoperable. There is no doubt that radial treatment does retard the growth of malignant neoplasms, and, given time enough might perhaps completely destroy many, but, in internal cancers, sufficient dosage can not be employed long enough and often enough to overcome the rapid growth of the tumor tissue.

Many of the distressing symptoms of inoperable cancer are bettered for a time by the destructive action of x-ray or radium upon the malignant tissues. Many workers are doing thorough work in radiotherapy as a radical cure. Their reports so far are encouraging but complete reliance on their conclusions depends upon the verdict of time.

The distinction between operable and inoperable cases depends much upon the personal equation in respect to the operator. Some will argue that the patient is entitled to any chance, however slim, and therefore should be operated upon regardless of the extent of the malignant growth. They say that death on the table is preferable to the lingering suffering due to the disease itself. From the standpoint of the individual patient this reasoning may be good.

It is also necessary to consider the *sociological aspect* of the question. All will admit that the value of operation depends upon undertaking it at the earliest possible moment. Therefore the public must be educated to know that early operation offers the best hope. To this end it is not well to have a larger percentage of mortality in cancer operations than can be avoided, because patients will be in fear of such operations and will put them off, in spite of the best advice, until too late.

Every woman, before whom comes the question of operation for herself, knows of other women who went to the hospital, were operated upon for cancer, and died. She thinks not of the extent of the growth or its locality in the cases of those who died. They were operated on for cancer and they died; that is her argument. Therefore it seems to be the duty of gynecologists to refuse to operate on cases where there appears to be no hope of recovery.

Meanwhile he should do his utmost to educate women to the idea that early operation is the only proper treatment for cancer, and should encourage them to seek advice for any ailment of the breast or genitals which is in the least suspicious of cancer. The earlier the operation, the less the danger and the greater the prospect of cure. He should never, for any reason, put off for a day examination of a woman who comes to him on account of any suspicion of the presence of the disease.

He should make that examination thoroughly. He should weigh carefully the history, the symptoms, the digital examination, the speculum examination, the microscopic examination, and the chemical examination before he decides that any case is not one of carcinoma. Especially when the patient is of cancer age, that is, between forty and sixty, the burden of proof should be upon the negative. The probability of cancer should by no means be dismissed at other ages, no matter how young or how old.

Carcinoma of the Uterus

PATHOLOGY

Herzog very properly divides carcinoma of the uterus into three classes: carcinoma of the portio vaginalis, of the endocervix, and of the corpus uteri.

Carcinoma of the portio vaginalis cervicis arises from the squamous cells which line that part. It is an epithelioma, composed of squamous epithelial cells, with a connective tissue stroma of varying extent. This form is the most frequent of all carcinomata in women, occurring in about 30 per cent of all cancers. Next in frequency is carcinoma of the stomach, which includes about 20 per cent of all cancers. Of uterine carcinomata, epithelioma of the portio comprises nearly 60 per cent.

Epithelioma of the portio begins as a small area of infiltration of

the mucous covering. The area is hard to the touch. There is no pain, bleeding, or discharge. The essential pathological change is that, at the indurated point, the epithelium begins to invade the subjacent tissue of the cervix. The affected area increases in size, both superficially and deeply.

The neoplasm, which has arisen from the cuboidal cells of the rete mucosum, extends both downwards into the submucous tissues and upwards as small warty papillæ into the cavity of the vagina. The

Fig. 136.—Points of origin of uterine cancer. A, adenocarcinoma of body; B, adeno-carcinoma of endocervix; C, epithelioma of portio vaginalis.

papillæ may grow exuberantly and form a cauliflower-like mass which may fill the vaginal vault. The papillæ are friable and bleed easily to the touch or from the effects of coitus.

The cauliflower-like mass breaks down, leaving an *ulcerated* sur-face with hard base and margin. Meanwhile the growth into the substance of the cervix has extended and has changed that tissue to a mass of carcinomatous alveoli surrounded by connective tissue stroma. Scattered nodules may be felt at a distance from the

original site.   The margins of the ulcerated region are indurated and irregular.   The sides and base are friable and covered with shreds of necrotic tissue.

Extension of carcinoma of the portio is usually along the adjacent walls of the vault of the vagina, because of the tendency of carcinoma to grow along the continuity of mucous membrane of the same cellular type as itself.   Occasionally the growth extends into the body of the uterus above the internal os, usually by direct growth into the
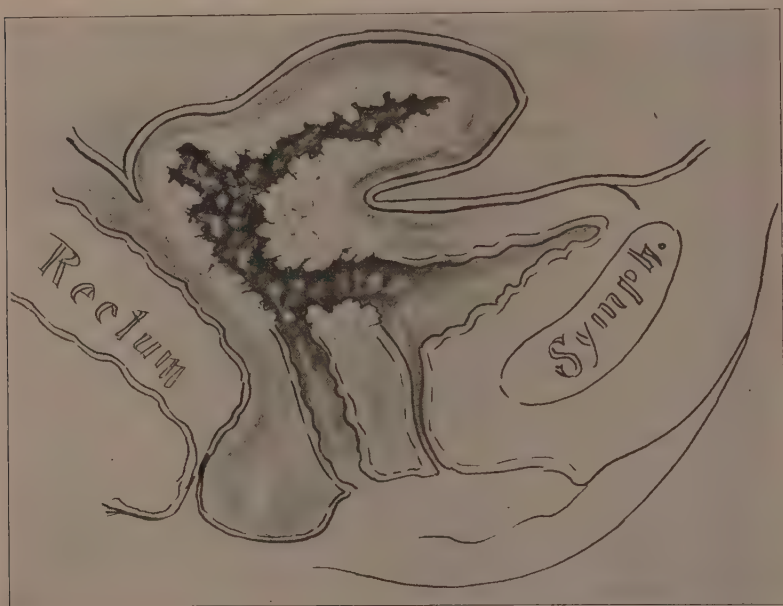
Fig. 137.—Cancer of cervix involving rectal and bladder walls.

tissues rather than along the mucous membrane.   Extension to the bladder and rectum is a late manifestation.   Fistula may result.

Lymphatic metastasis begins very early, almost as early as in carcinoma of the cervical canal.   The parametrium becomes indurated and renders the uterus immobile.   The metastasis follows along the chain of glands in the lower part of the broad ligament, to the glands along the iliac vessels.

Since the ulcerated tissues in the region of the primary carcinoma are often infected by various microbes, much of the induration in

the broad ligament and parametrium and some of the enlargement of the pelvic lymphatic glands may be due to that infection.

Carcinoma of the cervical mucosa is considered by most authorities next in frequency to that of the portio. Probably it comprises about 20 per cent of uterine cancers. It is an adenocarcinoma, arising from the glandular epithelium of the mucosa and glands. It usually grows inwards into the substance of the cervix, instead of outwards

Fig. 138.—Adenocarcinoma of body of uterus. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

into the lumen of the canal. In consequence its cells are crowded by pressure and take on a *cuboidal form.* The alveoli, representing the acini of the glands, may have a minute lumen or be solid columns. There is more connective tissue between the alveoli than there usually is between the glandular acini of adenocarcinoma of the corpus uteri.

Carcinoma of the cervix is likely to ulcerate even sooner than carcinoma of the portio. This tendency is due to the fact that it

grows inwards and its alveoli become compressed and deprived of nutrition earlier than those of the portio epithelioma.

The diagnosis, however, is not so easily made, because digital and specular examinations do not so easily reveal a small nodule within the cervical canal as upon the surface of the portio. Infection of the ulcer by putrefactive germs or infection of the serous discharge often causes a fetid odor. Hemorrhage may sometimes be excessive because of ulceration into a fairly large vessel. Ulceration, in later stages, may destroy almost the entire cervix, including much of the portio, leaving only a shell.

Adenocarcinoma of the corpus uteri is probably the least frequent of the uterine cancers, constituting about 5 to 10 per cent. It occurs more often in women who have never been pregnant. It begins as a local overgrowth of the uterine glands, from whose epithelium it arises. As the glandular growth increases, it pushes out into the uterine cavity in the form of a papilloma. At this stage it is difficult to identify it as malignant under the microscope.

As it progresses the glandular tumor increases in size and extends further into the formerly healthy mucous membrane, even encroaching upon the muscular tissue beneath. The glandular tubules of the neoplasm increase so that there is little room between them, giving rise to the ''dos-a-dos'' (back-to-back) arrangement. The epithelial cells of one gland seem to come into intimate contact with those of its neighbor without intervention of a perceptible amount of connective tissue.

The rapid proliferation of the epithelial cells also produces glands with more than one layer of cells. As the tumor grows, it causes the uterus to enlarge, as well by hypertrophy of its walls as by dilatation due to the tumor itself. Thus the neoplasm becomes compressed, the growth tends towards the muscular coat, the glandular tubules become distorted, and the cells become more cuboidal in form. The general tumor becomes denser. Sometimes the papillary growth extends through the uterine cavity and may protrude from the external os.

In the later stages the whole mucous membrane of the body of the uterus may become involved in the neoplasm, and the uterus may increase in size to that of an early pregnancy.

The disease is less malignant in the body of the uterus than is carcinoma of the cervix or of the portio. Either the original growth

is less destructive or less vigorous in its metabolism than those of
the other localities, or else the tough muscular wall of the corpus
uteri—especially so in nulliparæ—limits extension to neighboring
organs and limits metastasis via the lymphatics. It will be remem-
bered, in this connection, that the cervix and the lower segment of
the uterus are in the center of a rich supply of lymphatics which
occupy the areolar spaces of the parametrium. The lymphatics
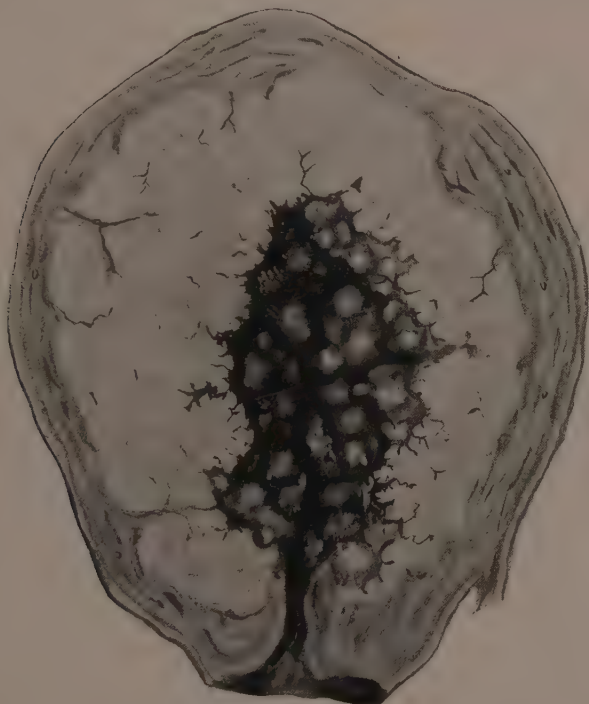
Fig. 139.—Adenocarcinoma of uterus. (From specimen in Obstetric and Gynecologic
Museum, Loyola University School of Medicine.)

which drain the body of the uterus are very few in comparison.
They are least developed in the nulliparous uterus.

Carcinoma of the corpus uteri appears at a more *advanced age*
than carcinoma of the other regions of the uterus. It is most common
between the ages of fifty and sixty, appearing after the menopause
has long been established. Not infrequently, however, there is an
abnormal continuance of the menstrual flow beyond the usual time
for it to cease. This persistence of menstruation may be caused by

the presence of the adenocarcinoma in very early stage, when it may possess only a moderate malignancy. Perhaps even a few years may elapse between the actual beginning and the discovery of the disease.

Extension of carcinoma of the corpus is usually into the cervix if it occurs at all. It sometimes extends by direct growth to the peritoneal coat of the uterus, and rarely may extend through adhesions to the adherent neighboring organs.

Lymphatic metastasis occurs in the connective tissue spaces between the folds of the broad ligament. It may extend via the lymph channels to the tubes or ovaries.
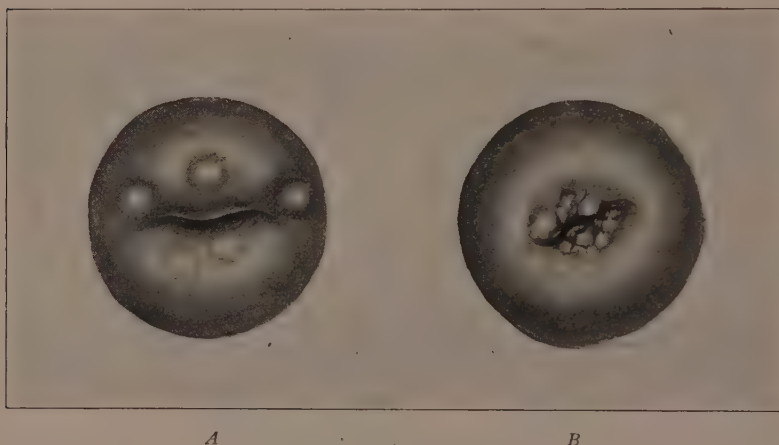
Fig. 140.—*A*. Retention cysts of cervix. *B*. Beginning carcinoma. (From preparation in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

General metastasis seldom occurs until late, that is, until after the involvement of the broad ligament, the tubes, or the glands of the pelvis. The disease shows no more tendency to spontaneous healing than other cancers, but its growth is slower than most others. Sooner or later, unless removed, it will cause the death of the patient.

Diagnosis

The diagnosis is made from the history, the symptoms, the physical examination, the microscopic findings, and from the biochemical reactions.

The early *clinical history* is rarely definite enough for the forma-

tion of a diagnosis, but may elicit significant data. For practical purposes, any woman between the ages of 35 and 60 who complains of increased menstrual flow, irregular hemorrhages, return of menses after apparent menopause, leucorrheal discharge and pelvic pain should be considered suspicious. The suspicion should be investigated until disproved or proved. The examination should be immediate and thorough. There is no excuse for subjecting the patient to a course of observation, as every day lessens the chances of cure if she has carcinoma.

Emaciation and cachexia appear so late that they are only of confirmatory and not of practical value.

Bimanual examination may reveal a uterus slightly enlarged, if the carcinoma is in the corpus. It may show an indurated portio, a nodular hardness in the center or a cauliflower exuberance in the vault of the vagina. The contact of the finger may cause bleeding. The discharges on it may be fetid. Immobility of the uterus may be perceived with induration extending into the parametrium. A growth may be noted on the vaginal walls.

The *speculum* may reveal to the eye a greatly hypertrophied cervix with old cicatrized and perhaps excoriated lacerations. Erosions about the external os should be viewed with suspicion in women of the age which we are considering. Papillomatous or warty growths or exuberantly granulating ulcerations may be seen on the portio. A slight bloody discharge may be seen coming from the cervical canal.

If there are any suspicious places in the portio, a wedge-shaped piece should be cut out including such a place. If there is hypertrophy of the anterior or posterior lip of a cervix which has been lacerated, it is usually advisable to perform amputation of the cervix and subject the pieces removed to *microscopic examination* at once, after sectioning with the freezing microtome.

If there is suspicion of carcinoma of the endocervix or of the corpus, one should remove the superficial mucosa with the sharp curette, save all the pieces, and examine them microscopically. It is not always possible to do this with the freezing microtome. In that case the pieces removed should be placed in 5 per cent formalin solution and run through the histological processes incident to imbedding and sectioning.

Ectropion due to old lacerations is usually accompanied by hyper-

trophy of the lips of the cervix. It should be differentiated by the microscope if there is any doubt. It is grossly differentiated by the presence of longitudinal striæ representing the mucous membrane of the cervical canal which is everted by the ectropion, and by the fact that the tissues are not friable, not indurated, and show no tendency to bleed.

In degeneration of the cervical glands into the *cysts of Naboth*, the follicles are hard, circumscribed, isolated, and give the feeling of shot under the surface. They accompany endocervicitis and are usually the result of old lacerations, unhealed or infected. The cysts contain a gelat'nous substance, the escape of which causes the cyst to collapse.

Superficial *erosions*, while they bleed readily, are merely on the surface, show no loss of substance, and no induration. The surface is covered with healthy columnar epithelium, or partially with healthy granulation tissue.

Syphilitic ulcerations of the cervix are rare at the cancer age. Specific condylomata seldom appear in this locality; they appear more commonly in the vulva. The Wassermann test will be confirmatory of the diagnosis of syphilis, but one must not forget that a patient may suffer from syphilis and carcinoma at the same time. In doubtful cases time is too precious to be wasted in antisyphilitic treatment. The microscope will usually reveal the difference.

TREATMENT

Operative.—The whole uterus must be removed, as well as the tubes and ovaries. In adenocarcinoma of the corpus uteri simple vaginal hysterectomy offers as good prognosis as abdominal. Owing to the slower extension of carcinoma in the body of the organ and the delayed lymphatic metastasis, the disease can be completely removed by removing the uterus and appendages, provided that the case is operable at all.

VAGINAL HYSTERECTOMY.—Vaginal hysterectomy is performed as follows: The cervix is pulled down by strong vulsellæ. A transverse incision is made at the junction of the portio and vagina in front and behind the cervix, and the two incisions are united on the sides. The incisions extend through the vaginal mucous membrane to the subjacent connective tissue layers. By blunt dissec-

tion, best with the finger covered with gauze, the bladder is pushed away from the attachment to the cervix and lower part of the corpus uteri. When the fold of peritoneum between uterus and bladder appears, it is incised and the incision is extended with scissors towards the sides. With the bladder the ureters are removed from danger. The posterior vaginal incision is deepened to extend into the cul-de-sac of Douglas and extended by scissors to the sides.

A strong catgut suture in an aneurism needle is passed through the lower part of the broad ligament from behind forwards and tied long. The broad ligament is then cut through with scissors between the uterus and the tied suture as far as it is included in the knot. A similar suture is passed on the other side and the cut is made as before.

The uterus can now be pulled down farther and another section of the broad ligament is put upon the stretch and comes into view. This is sutured and cut on each side as before and the uterus is pulled still farther down. Sometimes three or even four such sutures on each side are needed, depending upon the size of the uterus. Then the appendages can be felt or seen. A suture is passed on the aneurism needle through the infundibulo-pelvic ligament and the ligament is cut by the scissors. The uterus can then be turned out and the other infundibulo-pelvic ligament is sutured and cut. By this means the uterus and appendages are removed in one mass.

Search is diligently made for points of hemorrhage in the stumps of the broad ligaments and these are secured. The stumps are then sutured to each other and the anterior and posterior edges of peritoneum sutured to the stumps of the ligaments. The long ligatures are cut short. Then the wound in the vault of the vagina is closed, and the operation is completed. Drainage is not needed unless there is suspicion of infection, in which case a strip of gauze is passed into the wound before closing the peritoneum. If the pelvic floor is very lax, as from old perineal lacerations, it should be repaired. Otherwise there may be a tendency for the vaginal walls to prolapse and permit a hernia.

If the carcinoma involves the cervix or portio vaginalis, the probability that lymphatic metastases have occurred in the pelvic glands and parametrium requires the complete radical abdominal operation.

RADICAL ABDOMINAL OPERATION.—The radical abdominal operation for cancer of the uterus, which was originated by Ries, of Chicago,

and modified by Wertheim, of Vienna, and goes by the latter's name, is performed as follows:

With the patient in the Trendelenberg posture, the abdomen is opened by a long incision, reaching at least from pubes to navel. The intestines are packed off with gauze pads, and the uterus is explored with eye and fingers to ascertain whether the case is an operable one. If it is decided that there is hope for an entire removal of the carcinomatous tissue, the operation proceeds.

The infundibulo-pelvic ligament is secured on each side by strong catgut sutures a safe distance from the brim of the pelvis, and cut. The ureter runs in the ligament at this point and might be injured through lack of care. The round ligament is also secured on each side and severed from the uterus. It is well to pass a mass suture or a clamp near the uterus on each side to prevent collateral hemorrhage from the distal ends of the ovarian arteries, through their anastomoses with the uterine arteries. An incision is made through the broad ligament on each side, cutting towards the uterus diagonally downwards, and bleeding points are secured.

The peritoneum across the front of the lower segment of the uterus is cut, uniting the wounds in the broad ligaments, and dissected downwards. The bladder is separated from the uterus, cervix, and upper vagina. The peritoneum across the cul-de-sac is incised with the sacrouterine ligaments and dissected downwards, uniting the broad ligament wounds posteriorly.

The fat and connective tissue with the lymphatic glands in the parametrium on either side of the lower portion of the uterus are freed by blunt dissection, but left attached to the uterus. The ureters are sought, dissected free and then avoided. The uterine arteries and branches are secured before or after being cut. Then the uterus, parametrial tissue, and upper portion of the vagina are separated from the rest of the vagina by means of right-angled clamps which grip across the vagina just below the lower end of the cervix. Below these clamps the vagina is cut across and secured by forceps. The clamps serve to prevent contamination of the peritoneum and the wounds in the pelvic cavity by the cancerous mass of the cervix.

The whole mass, uterus, parametrium and upper vagina are removed together. The object in so removing the whole mass is to avoid opening up possible carcinomatous tissue. It is possible to

inoculate the incision if the knife or scissors cuts through cancerous tissue. Cancerous grafts will grow readily when transplanted to other parts of the host's body, although they can not be successfully transplanted from one person to another.

The operation is finished by suturing the vault of the vagina together, covering the pelvic floor with peritoneum and closing the abdominal incision.

Ries advises a further search for enlarged glands along the track of the iliac vessels and along the round and sacrouterine ligaments. The general opinion seems to be, however, that the immediate mortality of the operation is so increased by this as to make it unjustifiable. This opinion is strengthened by the fact that there is almost always a recurrence whenever the pelvic glands removed have been proved cancerous. In other words, the opinion of most operators is that when the pelvic glands are involved in the carcinoma, the case is hopeless.

The *immediate mortality* of the radical abdominal operation for malignant disease of the uterus is high. It can not be done quickly, even by the most expert operator, any more than can the radical operation for carcinoma of the breast. The dissection of the parametrium from the pelvic floor in the region of the ureters must be done carefully and thoroughly. The danger from hemorrhage and from shock is great. On account of the long time during which the abdomen must be open, there is not a little danger of peritonitis.

The operation is *justified* by several factors. In the first place it begins as an exploratory measure, giving a chance to estimate whether the pelvic glands and the parametrium are so much involved as to render further procedure hopeless. It enables the operator to see while he is separating the ureters and while he is dissecting the parametrium free. No vaginal operation, feasible for the ordinary operator, offers as good hope of removing all of the disease.

Recurrences of carcinoma of the cervix and portio after the radical abdominal method are far less than by the simple vaginal hysterectomy. It must be remembered that we are considering carcinoma of the portio and of the endocervix, and not that of the corpus. Of those patients operated upon by vaginal hysterectomy five years previously for carcinoma of the body of the uterus, and who survived the operation itself, 53 per cent were free from re-

currence. In cancer of the portio and cervix, the percentage of free-
dom from recurrence five years after vaginal hysterectomy is less
than 20 per cent. Five years without recurrence is the period gen-
erally accepted after which a cancer may be considered cured.

Indications for radical operation depend upon determining whether
the case is still operable. This is a question in which the personal
equation will enter largely. There are certain general rules which
serve as guides. If the uterus is still movable on bimanual examina-
tion, if the vaginal walls are little involved, if the base of the blad-
der is free from carcinomatous induration, and if the exploration
after opening the abdomen shows no evident involvement of the pel-
vic glands along the iliac vessels, then one is justified in continuing
with the operation. If these points are the contrary, then the case
may be reckoned as inoperable.

Palliative Treatment.—Inoperable cases, either those recognized
as hopeless from the first, or recurrent cases are the only ones which
call for palliative treatment. Palliative measures are directed to-
wards nutrition and stimulation, relief of pain, prevention of hemor-
rhage, prevention of sepsis, and prevention of odor.

Nutrition and stimulation are aimed to support the patient's bodily
strength, the heart's action, digestion and assimilation, and her
psychic well-being. For supporting strength one gives iron, arsenic,
strychnia and sometimes moderate doses of alcoholics. In such cases
one need have no fear of habit-forming. For supporting the action
of the heart digitalis or strophanthus is sometimes indicated, as well
as short periods of rest in bed, warm baths, bodily massage, etc.

For digestion and assimilation one must first secure a nourishing
and easily digested diet, preferably in small and frequent meals.
Artificial digestants, such as pepsin, may be useful. Meantime an
atmosphere of cheerfulness must be kept up as long as possible, even
to the extent of irrational optimism.

Relief of pain will sooner or later become the main object of pal-
liative treatment. As long as possible the medical adviser will ab-
stain from morphine and other opiates, but he has no right to deny
them when nothing else will relieve the pain. In the later stages
pain is likely to be excruciating and no patient should be punished
by being compelled to endure it.

The dose of morphine to relieve the pain of inoperable carcinoma
is *enough*. Towards the last the patient may have to be kept almost

continuously narcotized. In the earlier stages bromides, veronal, and hypnotics in general may suffice to relieve nervousness and permit sleep. Pyramidon in doses of five grains repeated every three or four hours or oftener will sometimes take the place of morphine for a while. Regular bowel movements not only aid the digestive organs, but also are a means of preventing some of the pain and discomfort.

Prevention of hemorrhage may be attained sometimes by the use of ergot and hydrastis in sufficient doses often enough repeated. Often the swelling and pain, as well as the hemorrhage, are diminished by such astringent drugs. When bleeding is copious or alarming, the vagina or the uterine cavity must be packed with gauze soaked in a weak solution of adrenalin or in gelatin. Not infrequently curettage, the actual cautery, or even vaginal hysterectomy may be necessary to prevent serious hemorrhage.

Prevention of septic infection and of the foul odor from the sloughing masses may be attained for a time by antiseptic douches. Removal of these masses by the curette followed by the actual cautery will often be necessary in later stages. This last treatment usually requires anesthesia.

Gellhorn, of St. Louis, has recommended curettage followed by application of *acetone*. The solution used is that employed by photographers and should be applied on gauze packs in full strength. Before packing with this acetone gauze, one should protect the vulva and vagina by vaseline and should place dry gauze in the outlet of the vagina. Pure acetone, as it is furnished, is irritating and painful. Douches of weaker solutions may be used. The acetone pack is repeated twice a week until the odor is under control and then the douches of weaker solutions may be employed daily.

Percy, of Galesburg, has offered to the profession a method of treatment adapted for inoperable cases which, in his hands, has shown some promise. It consists of *cautery* irons heated to a red heat and thrust into the carcinomatous tissues. The object is to burn some of the superficial tissue and to partially cook the deeper by the heat from the iron. The vagina and the healthy parts are protected by a water-jacketed speculum. He claims that sloughing and the nasty odor are reduced to a minimum, and even that in some cases apparently inoperable carcinomata have been reduced in size

and the surrounding induration so much reduced that radical operations could be successfully performed.

As before stated, *radiotherapy* often delays the growth of the neoplasms so long that the patients may enjoy some months of comparative comfort. In treating inoperable malignant neoplasms, the physician should feel that he is doing good and important work in rendering the melancholy lot of such patients a little more endurable.

Carcinoma of Tubes and Ovaries

Primary carcinoma of the tubes is very rare. It arises from the cylindrical columnar epithelium of the tubal mucosa. It usually takes on a papillary form, growing out into the lumen of the tube, filling and distending the cavity. If the mucous membrane is free from the neoplasm, the growth may be considered as secondary, usually from a primary focus in the uterus. The disease in the tube is generally unilateral. The size of the tumor varies from that of a pea to that of a large orange. The peritoneal surface of the tube is smooth and the consistency of the whole mass is rather soft.

EXTENSION of the carcinoma is towards the uterus or through the serous coat into the peritoneal cavity and thence to neighboring organs. Lymphatic metastasis follows the same course as that of carcinoma of the body of the uterus.

THE DIAGNOSIS is rarely made until the abdomen is opened. Bimanual examination reveals an enlarged semi-solid tube which may be mistaken for a thickened pyosalpinx or a cyst of the ovary. When the abdomen is opened, the diseased tube appears as a smooth lobulated tumor rather pale in color. It is not dense to the touch, but does not fluctuate.

THE TREATMENT is removal of the tube. If recognized as carcinoma during the operation, both tubes, both ovaries, and the whole uterus should be taken away.

Secondary carcinoma of the tube arises by extension or lymphatic metastasis from the ovary, or the corpus uteri.

Carcinoma of the ovary is also rare as a primary disease. The malignant papillomatous cystadenomata of the ovary are classified with the cysts and will be considered in that place. It is believed by many authors that primary carcinoma of the ovary does not exist. The organ normally contains no epithelial cells in the true sense.

It is possible that carcinoma may arise from the primordial cells of Pflüger's columns.

The disease in the ovary is almost always bilateral when it appears to be primary. In a large number of cases examined, ante-mortem and postmortem, the stomach has been found to be the seat of a carcinoma of the cuboidal-celled or of the adenomatous variety and the carcinoma in the ovaries in these cases is of the same type. It is explained that some of the detached epithelial cells of the primary carcinoma in the stomach, or in the intestinal tract, reach the peritoneal cavity through the stomach walls and gravitate to the cul-de-sac of Douglas. There they attack not the peritoneum, which is somewhat immune to carcinoma, but the ovaries which are the susceptible organs nearest.

The tumor is of the cuboidal-celled form with alveoli in the midst of rather soft connective tissue stroma. Therefore the cancer is of the so-called medullary or encephaloid type. The diagnosis is rarely made until operation or often not until after removal and pathological examination. Bimanual examination reveals only two rather soft enlarged ovaries which are usually supposed to be cystic or else the tumors are mistaken for pus tubes.

Both ovaries are usually removed, but the patients usually die later of cancer of the stomach, unless that is removed by operation at the same time.

Carcinoma of the Vulva and Vagina

Carcinoma of the vulva or of the vagina is seldom found. The rarity of carcinoma in these localities exists in spite of the frequent traumatisms of coitus and labor to which the parts are subjected. Even repeated infection with the gonococcus or syphilitic germ does not seem to predispose to cancer in these parts. It is a disease of old women. The majority of cases occur after fifty-five years of age, and many as late as seventy.

Carcinoma of the vulva usually arises from the skin of the labia majora, from the pseudomucous membrane of the labia minora, the fourchette, and the vestibule, in which case it has the squamous-celled type, epithelioma. Epithelioma of the vulva and vagina take on all the general external appearances which are observed in carcinoma of the portio vaginalis, that is, the warty appearance, the condylomatous, and the ulceration. In some of the ulcerative types

there is something of a tendency to heal as in rodent ulcers of the
face. Occasionally there does occur a spontaneous healing of cancers
of this kind.

Less often the neoplasm arises from the epithelium of the glands;
the vulvovaginal, the sweat, or the sebaceous glands. In this case the
tumor is of the adenomatous type.

The *location* of carcinoma of the vulva is most often in the labia
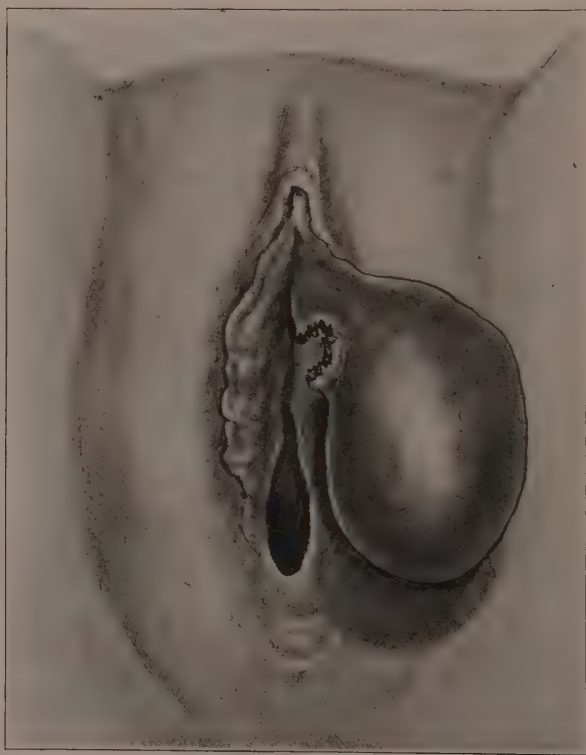
Fig. 141.—Epithelioma developing in pedicle of fibroma of labium minus in woman seven
months pregnant. (From preparation in Obstetric and Gynecologic Museum, Loyola Uni-
versity School of Medicine.)

majora, next in the labia minora, in the fourchette and the neighbor-
hood of the urethra. Occasionally the clitoris is affected alone. *Ex-
tension* is towards the vagina or outwards upon the skin. *Lymphatic
metastasis* is via the inguinal chain of glands. These are involved
in more than half of the cases observed.

THE DIAGNOSIS is made by the appearance of exuberant growth associated with ulceration, the warty appearance, or the cauliflower appearance. If in doubt it is easy to remove a piece for microscopic examination.

TREATMENT consists of radical removal of the whole neoplasm and much of the surrounding skin and mucous membrane. The inguinal glands must always be removed. Carcinoma of the clitoris requires complete removal of the whole organ and also dissection of the inguinal glands. Carcinoma of the membrane about the urethra requires resection of that tube as far upwards as possible and removal of the mucous membrane of the vestibule for some distance around the meatus.

When the vulva is extensively involved, removal of the whole vulvar tissues may be indicated. This is done by making an elliptical incision around the external genitals from in front of the clitoris to the center of the perineum, another circular incision around the introitus vaginæ, and removing deeply all the skin and mucous membrane. The anterior third of this oval denudation is sutured in a median straight line, embracing the margins of the urethra at its posterior portion. The external skin is then sutured to the edge of the mucous membrane around the entrance of the vagina.

The *x-ray and radium* have often caused apparent cures in carcinoma of the vulva when not too extensive.

Carcinoma of the vagina is encountered even less often than that of the vulva. It occurs in old women, more often in those who have borne children. The usual site of primary carcinoma is the posterior wall of the vault. Since this is also the favorite place for the disease secondary to carcinoma of the portio and since the supposed primary carcinoma of the vagina is usually of the squamous variety, the suspicion is left that the disease is almost always secondary to carcinoma of the vaginal portion of the cervix, perhaps unrecognized. On the other hand there is occasionally seen a carcinoma of the vagina which arises from preformed cysts derived from embryonic ducts in the vaginal wall, and composed of columnar or cuboidal epithelium.

THE DIAGNOSIS is made from hemorrhage, purulent and often odorous discharge, some pain, and the appearance to the sight of a flattened tumor with ulcerating center and exuberant margin.

The only TREATMENT looking to radical cure is complete excision

of the growth; usually with most or all of the vagina. This is done by dissecting away the vaginal wall from the subjacent tissues, and removing it. Since there is such a rich lymphatic supply running in all directions into loose areolar tissue, it is almost always hopeless to expect recovery.

Chorioepithelioma Malignum

An extremely rare but interesting form of carcinoma of the internal genitals of woman is chorioepithelioma malignum, called also *deciduoma malignum, decidual sarcoma or syncytioma malignum*, depending upon the different theories held as to its origin. The general opinion at the present time is that the disease is a true malignant neoplasm of epithelial character arising from the epithelial layers of the chorionic villi of the ovum. These layers are derived from the ectoderm of the embryo. Therefore this tumor is unique in having origin in the tissues of one individual, but growing destructively in the tissues of another.

The **etiology,** like that of all malignant disease, is unknown. Why some of the cells of the Langhans layer or of the syncytium of the villus take on a malignant development is as obscure as the same question in relation to other cancers. The strange metamorphosis of the ovum known as *cystic mole* or hydatid mole, (German Blasenmole) is found in the majority of cases to have preceded the appearance of the chorioepithelioma. The syncytial buds and the other epithelial structures of the grape-like cysts into which the villi have been transformed, seem to penetrate to an unusual depth into the uterine tissues. Even the musculature is invaded, often deeply, sometimes even to the peritoneal surface.

The usual situation of the tumor is the placental site. It appears as a soft red bleeding mass rising a little above the level of the surroundings. It consists of irregular alveoli of epithelial cells and syncytial bodies surrounded by a loose reticulum of connective tissue resembling that of the villus. The cells are very destructive to maternal tissues and often break into blood vessels. For that reason there are always many hemorrhages within the tumor and within the intervascular spaces of the uterine tissues.

The **diagnosis** is suggested by the history of a previous labor, abortion, or cystic mole. *Hemorrhage,* of increased severity, ap-

pears, and continues long after the time when it should normally cease. The diagnosis can be confirmed only by curettage and *microscopical examination* of the scrapings. Usually the scrapings are not examined because the hemorrhage is taken to mean retained portions of ovum or placental polyp. The bleeding returns after curetting, and then perhaps the examination is made.

Treatment consists in radical removal of the uterus.

The **prognosis** is even worse than that of other cancers of the uterus. The tumor sometimes extends to the vagina. Indeed sometimes it seems as if the discreet secondary tumors of that organ were metastatic. *General metastasis* is more frequent than that through the lymph channels because of the tendency of the cells to break into the blood vessels.

CHAPTER XV

NEOPLASMS (Cont'd)

BENIGN ADENOMA

Benign adenoma is a glandular neoplasm which lacks the characteristics of malignancy. Its cells do not tend to excessive and exuberant proliferation, its glandular elements do not have the back-to-back arrangement of the malignant adenomata, there is no tendency towards destructive growth into neighboring tissues, there is no breaking through basement membranes or into blood and lymph channels.

There is no metastasis, either lymphatic or general, and there is no recurrence after removal. There may be discharge of mucus on account of the excessive activity of mucus-producing cells due to the abundant blood supply of the tumor. There may be purulent discharge due to infection. There may be hemorrhage due to congestion or to slight trauma. There may be pain, vesical or rectal tenesmus, or other manifestation of pressure by the growing tumor. In the uterus there is very likely to be irregularity of the menstrual function.

Venereal Warts of the Vulva

The cauliflower excrescences due to discharges from gonococcus and streptococcus infection, and the syphilitic condylomata are not true adenomata. They arise in squamous epithelial membranes and represent hyperplasia of the papillary layer of these skin-like structures. In gross appearance they resemble the benign adenomata of the cervix and of the uterus. They appear as papillomata rising above the surface like the cotyledons of a cauliflower. The squamous epithelium of the normal surface of the affected mucous membrane is macerated and the papillary tumors grow out from numerous pedicles. The different papillæ are covered with a few layers of cuboidal cells resembling the cells of the rete mucosum and derived from them.

The hyperplastic growth of these epithelial structures is due to the

hyperemia incident to the irritation of the acrid discharges. Removal of the papillæ and cleansing of the surface usually cures the disorder. Simply keeping them clean and free of discharges from the genital tract higher up will sometimes suffice without surgical removal.
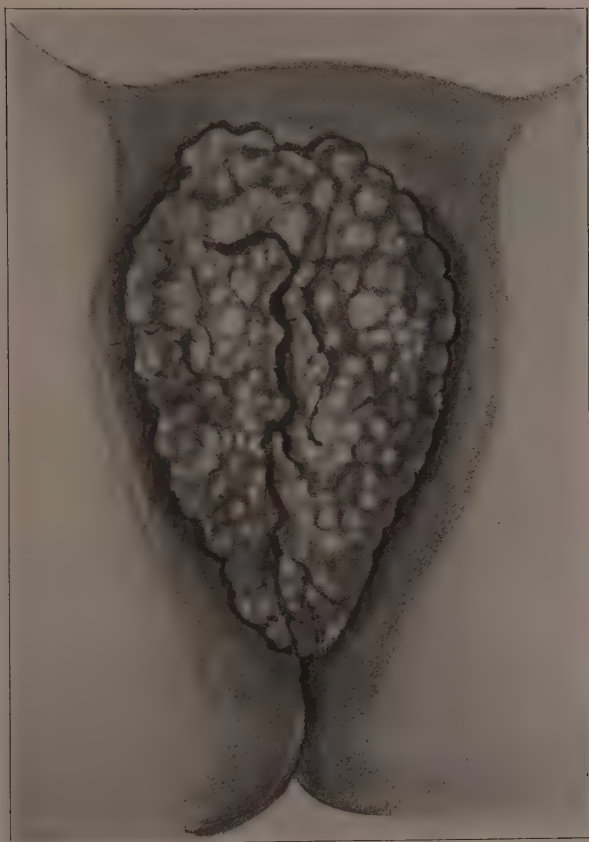
Fig. 142.—Condyloma acuminata.

Polyp of the Cervix and Uterus

Benign adenoma of the cervical or uterine mucous membrane begins as localized hyperplasia of the glandular structures of the mucous membrane. The swollen epithelial tissue grows out into the lumen and gradually expands into a polypoid mass attached to the wall by a pedicle. Such polyps grow in the lines of least resistance,

and therefore extend towards the external os in the case of cervical and towards the internal os in the case of uterine polyps. Often a uterine polyp will extend through the cervical canal and external os and appear in the vagina. Most of the polyps which protrude from the external os, however, arise in the cervical mucous membrane.

The **microscopic appearance** is an excess of glandular tubules with large spongy connective tissue spaces. Often there are large vacuoles in the edematous specimens filled with serous fluid. The tubules of the glands are often enlarged, sometimes into small cysts.

The usual **cause** of the hyperplasia which starts these growths is increased food supply to the glandular elements because of hyperemia due to irritation from mild or chronic infection or from pelvic stasis. The stasis may result from interference with the pelvic circulation by swellings, tumors, or, most of all, adhesions which bind in masses the pelvic organs. The disturbance of circulation in the uterus caused by the presence of a fibromyoma often causes local glandular hyperplasia of the mucous membrane of that organ.

The earlier **symptoms** of these papillary adenomata are hemorrhage, mucopurulent discharge, and excessive menstrual flow. When they protrude, they look like reddish velvety masses hanging out of the os. They usually bleed freely when injured. Sometimes they become edematous at the bulbous ends because of poor return circulation in the polyp itself. In that event they appear paler and less velvety.

Treatment consists in removing the papillary tumors by means of the wire snare or by twisting off with forceps. The pedicles must be curetted. Usually the whole cervical canal should be curetted, or that of the uterus, in case of polyps from the corpus uteri.

FIBROMA AND FIBROMYOMA

Both fibroma and fibromyoma are *benign* mesoblastic tumors composed of tissue such as is found in the aponeurotic, tendinous, and muscular structures of the body. The typical *malignant* neoplasm of these structures is the sarcoma.

Fibroma is composed of wavy fibrous connective tissue derived from the subcutaneous connective tissue, from fascia, from ligamentous tissue, from the stroma of organs such as the ovary and from cicatricial tissue. The fibers are arranged in bundles running in all

directions and often more or less concentrically. Within the meshes of the fibrous bundles are a few nuclei. The tumors are rather dense and are surrounded by a capsule made of a denser layer of the same tissue. Sometimes muscle is included in the composition of the tumor.

Fibromyoma is composed of tissue like that of fibroma with the addition of much muscular tissue, usually of the smooth variety, (*leiomyoma.*) Those fibromyomata which contain striated muscle fibers are called *rhabdomyomata*. They are very rare. The density of the fibromyoma depends largely upon the proportion of fibrous tissue to muscle in its composition. The hard tumors contain more fibrous tissue and the soft ones more muscle. The muscular structure of these tumors is similar to that of the muscle of the uterus, the tubal walls, the uterine ligaments, and the media of arteries. In all of these fibromyoma may arise. A pure myoma is rarely found except in the earliest stages.

Alternating bundles of muscle and connective tissue fibers appear, arranged in rounded masses more or less concentrically, so as to form globular tumors. The larger tumors are composed of aggregations of these round bunches and knobs of fibrous and muscular tissue. The nodule may be compared to closely rolled balls of cotton-waste. At the periphery of the nodule, the fibers run more regularly parallel so as to form a sort of a capsule. The blood vessels enter the tumor from the periphery and curl around within the nodules between the bundles of fibers.

The muscular elements are the spindle-shaped cells of ordinary smooth muscle tissue, having elongated nuclei. Between them are the bundles of white and sometimes elastic fibers and a looser mesh of connective tissue, in which run the vessels. The small arteries have no trace of adventitia and their media consists of the muscular tissue of the tumor, therefore they are simply endothelial tubes running through the mass of the neoplasm.

As the fibrous tumors grow, their centers become more and more removed from the blood supply, which enters peripherally. Therefore there is a tendency to degenerations of various kinds. Fatty degeneration is not uncommon. Hyaline and myxomatous degenerations are less common. Calcification, which is not a degeneration but an infiltration, is of frequent occurrence in all sorts of fibrous tumors, especially those of large size.

Fibroma of Vulva and Vagina

Fibroma of the vulva takes origin from the subcutaneous connective tissue of the labia majora and minora and of the clitoris. The tumors appear as dense, round circumscribed masses covered by integument. They sometimes reach a considerable size and develop a pedicle because of their weight. Often pressure of clothing or surroundings, or maceration of discharges causes ulceration, which sometimes leads to infection of the interior of the tumor. The consistency of the tumor is usually hard. In some instances stasis of the venous return causes edema and lymphangiectasis, so that the tumor may be soft or even may fluctuate. Sometimes the connective tissue spaces become filled with mucus (myxofibroma). Rarely is there any muscular tissue in the tumors except when they arise from the ends of the round ligaments in the upper portions of the labia majora, when they may resemble fibromyomata of the uterus.

Fibroma of the vagina is very rare. It appears as a round hard tumor in the anterior wall and may be as large as an apple. The surface is usually smooth, covered by the flat epithelium of the vaginal mucous membrane. Smooth muscle fibers may be found sparingly within its structure.

Diagnosis.—Fibrous tumors of the vulva and vagina rarely cause much pain unless they exert pressure on surrounding parts. They make themselves known by their inconvenience. They often encroach upon the vaginal outlet or canal. They may cause pressure symptoms in bladder or rectum. They often ulcerate, may become infected, and may suppurate.

Treatment consists in removal by dissection. They do not return if completely removed and have no tendency to metastasis or extension.

Fibroma of the Ovary

Fibroma of the ovary takes its origin from the connective tissue of the stroma. It is a relatively rare neoplasm. It is a pure fibroma, containing no muscle. Its consistency is hard, its surface smooth, and its size varies from a mere nodule to that of a man's head. It may appear at any age.

Ascites is a frequent accompaniment, as with most of the solid tumors of the ovary. The cause of this is not easy to determine.

Pfannenstiel ascribes it to an irritation of the peritoneum from chemical substances elaborated by the tumor. Others consider that the fluid in the abdomen is due to stasis in the vessels of the broad ligament from pressure of the tumor.

The **diagnosis** is made from the ascites, pains in the side of the pelvis and the thigh corresponding to the affected ovary, irregularities of menstruation, and the finding of a tumor in the ovary on bimanual examination.

The **treatment** is excision. The specimen should be carefully examined microscopically to determine whether the neoplasm is fibroma, sarcoma, or carcinoma.

Fibromyoma of the Uterus

Fibromyoma of the uterus, often called *uterine fibroid,* is by far the most common neoplasm of the fibrous type which affects the female genitals. It is also the most frequent neoplasm of the uterus of any type. It occurs in from 4 to 5 per cent of all adult women examined. It is found in 40 per cent of all female cadavers beyond the age of fifty years. It is more frequent in negroes than in women of other races; in well-to-do than in working women; in single women than in married. Small tumors, which have never been the cause of any symptoms, are often found unexpectedly on bimanual examination, during operations, and at autopsies.

Age.—Uterine fibroids are very rarely observed in children, relatively seldom in women under thirty, most commonly between the ages of thirty and fifty, and rarely again in older women. About 70 per cent come to notice during the third and fourth decades of life. They grow during the sexually active period of a woman's life, but they have been observed before puberty and may begin after the climacteric.

Pathology

The tumor is composed of *tissue like that of the uterine wall;* combined muscle and connective tissue. The uterus is the organ of the body which contains the largest mass of smooth muscle. The most natural origin seems to be from the muscular tissue of the uterus itself, although some have held that it arises from the muscular coat of the uterine arteries and arterioles. Others think that fibromyoma

is developed from round cells which leave the lumen of the capillaries and change into connective tissue and muscular fibers.

The tumors have a *slow growth,* especially slow in those composed of fibrous tissue. Those composed largely of muscular fibers usually grow faster. It is rare to find only one fibromyoma in a uterus. The tumors are usually multiple and of varying sizes. One or a few may attain enormous dimensions, while others, scattered in different localities within the uterine walls, may be as small as peas. As many as fifty have been counted in one uterus. Hunter dissected a cadaver in which he found a fibroid weighing 140 pounds. The body without the tumor weighed 95 pounds. Stockard describes the case of a negress whose tumor weighed 135 pounds.

The color of the cut surface of fibromyoma varies between gray-white and rose-red. The fibrous gray-white knots present a sinewy, asbestos-like luster. According to most authorities, the smallest microscopical myomata are composed of pure muscle tissue without connective tissue elements. Rösger saw no hard fibroma smaller than a small cherry. The arrangement of the muscle bundles is along the continuity of the arteries. Many of the smaller myomata are surrounded by a connective tissue capsule.

The *muscle cells* have a length of about .05 to .25 mm. The ends are either single or split into two or more branches. The nuclei have, in the older cells, an ellipsoidal form; in the younger, a more rounded appearance. Cells and nuclei are often flattened. The cell protoplasm shows a longitudinal striation and is granular in the neighborhood of the nuclei. Many cells have two nuclei. In the nuclei are often found one or two glistening nucleoli as well as fine granules. The younger cells are more rounded or at least less spindle-shaped than the older.

The *connective tissue* lies between the muscle bundles. It consists, as a rule, of loose fibers very poor in nuclei. The few cellular elements of the connective tissue consist of long spindle-shaped cells with nuclei containing one or two nucleoli. The nuclei are usually very thin spindles. Karyokinetic figures are seldom observed.

The larger *blood vessels* run in the connective tissue between the nodules and send sparingly minute branches into their substance. The smaller arteries have no trace of adventitia. The muscle bundles of the myoma furnish the media so that the vessels appear

with their intima as endothelial tubes. There are more vessels at the periphery of the nodules than in the centers.

A few observers have described *nerve* filaments within the fibromyomata.
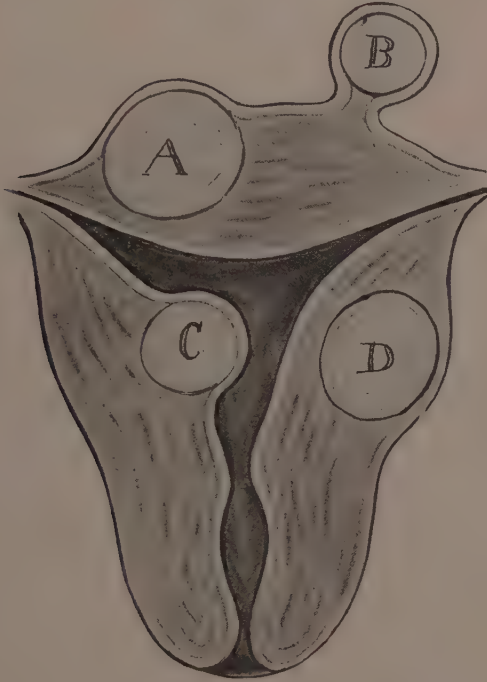
Fig. 143.—Showing topography of uterine myomata. *A*, subserous; *B*, pedunculated subserous; *C*, submucous; *D*, interstitial or intramural.

TOPOGRAPHY

According to the situation of the tumor in relation to the different portions of the uterine wall, fibromyomata are designated as subserous, submucous, and intramural. The histology and the anatomy of the neoplasm are not changed by its location; but its clinical history, diagnosis, prognosis, and treatment vary according to the topography of the tumor. Practically all start as intramural tumors, but many grow towards the serous or the mucous surfaces of the uterus. As they extend towards the peritoneal or the uterine cavities, the tumors may acquire pedicles, either short and thick, or long and flexible.

Subserous fibromyomata tend to spherical or oval shape with a pedicle attaching them to the uterus. Sometimes these pedicles become very attenuated, the tumors attach themselves to surrounding peritoneal surfaces, acquire vascular relations therewith, and finally may entirely lose connection with the uterus and remain attached to some other organ of the pelvis or abdomen. Usually, however, they retain attachment to the uterus by the pedicle and receive their nutrition in that way. The pedicle may become twisted so that the blood supply is gradually or quickly diminished, or even cut off. Various degenerative changes will ensue, from edema and congestion to acute gangrene.
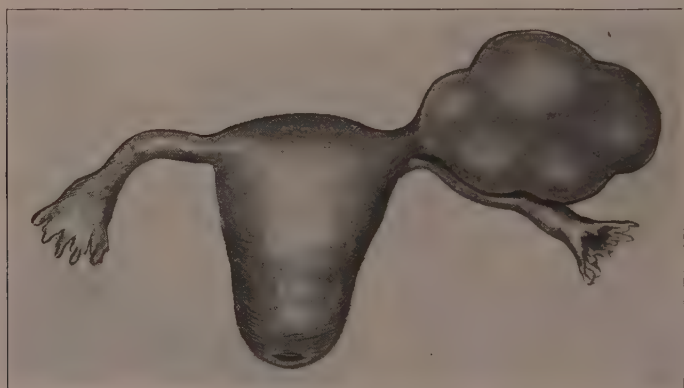
Fig. 144.—Pedunculated subperitoneal myoma.

The tumor may grow into the parametrium between the folds of the broad ligament, get its nourishment from the latter, and apparently be distinct from connection with the uterus. Such a tumor is called *intraligamentary.*

Submucous fibromyomata tend to a pear-like shape as they grow into the uterine cavity. They cause that cavity to enlarge and the uterine walls to distend and thicken. The pedicle is usually broad, but often may be drawn out by the traction of the tumor. The polypoid growth may appear at the internal or external os or may sometimes extend into the vagina. In the latter event, as it increases in size it distends the vaginal canal and presses upon the surrounding structures.

The submucous fibroid is richer in vessels than the others, and

tends to a quicker growth. The surface of the tumor is the endometrium. This is changed in its appearance by glandular hyperplasia or by flattening. In some places on the surface of the tumor the mucous membrane may be ulcerated or worn away.

Intramural fibromyomata are developed in the uterine wall as
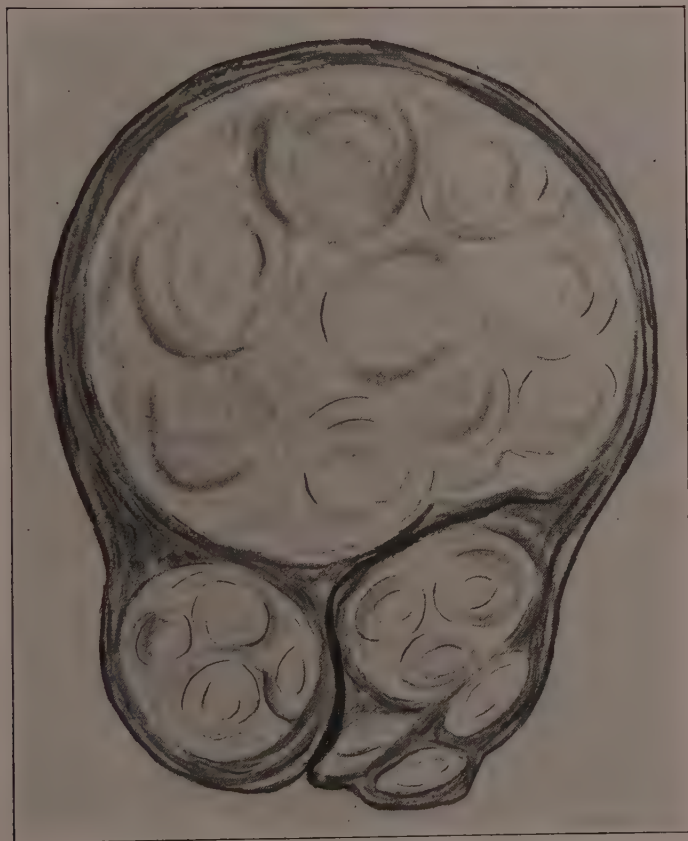
Fig. 145.—Intramural myoma of uterus. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

circumscribed tumors composed of tissue resembling that of the musculature of the uterus, except for the irregular arrangement of the fibers. They are surrounded by a sort of capsule composed of looser connective tissue which separates the tumor from the uterine

muscle itself.   This capsule enables one to shell out the fibroid in the process of enucleation.

Such tumors can not attain any considerable size without encroaching upon the uterine cavity.   The whole organ is enlarged and the walls are hypertrophied.   When several such tumors are present, the cavity is more or less distorted.   Often the pressure of the growing tumor thins out the muscle between it and the mucous membrane so that it appears as if the fibroid was covered on its internal aspect by the endometrium.   Sometimes the endometrium is atrophied in places by the pressure.

These intramural growths often attain *large size*, sometimes causing the uterus to become as large as at full term or larger.   If there is only one large tumor, the growth of the uterus will be symmetrical, giving the appearance of pregnancy.   This deception is increased if the fibroid is of soft consistency.   As a rule, however, the tumors are multiple, giving a nodular feeling on palpation and a nodular appearance when the abdomen is opened.

Fibromyoma of the cervix is rare.   It is usually situated within the muscular wall, but sometimes takes the form of a polypoid tumor projecting into the cervical canal or protruding from the os.   It may become a hindrance to labor by interfering with proper dilatation of the cervix or by preventing the entrance of the presenting part into the pelvic canal.

Influence of Fibromyoma Upon Other Tissues

Influence upon the Uterine Muscle.—A uterus affected with fibromyoma appears histologically like a pregnant uterus.   This influence is greater in the submucous and intramural than in the subserous types.   The muscle fibers and the bundles increase in size and arrange themselves like those of the pregnant organ in a lamellar manner so that, between the parallel layers of muscle bundles, connective tissue bridges are formed, giving a rhomboid appearance to the cut section.

This increase in size and number of the muscle fibers may be due to the hypertrophy from exercise caused by the frequent slight contractions which they undergo under the stimulus of the presence of the submucous or intramural fibroid.

Influence upon the Endometrium.—The uterine mucous membrane reacts to the presence of the intramural and submucous fibroids

by undergoing a hyperplasia. In cases where the tumor is large and of quick growth, the endometrium may be thinned out because of stretching of the uterine cavity. As a rule, both the glandular and the interstitial tissue of the endometrium become increased. It is believed by many that this hyperplasia may go on to the extent of developing an adenoma, even a malignant adenoma, of the mucous membrane of the uterus. It is certain that such adenomata are found in fibromyomatous uteri more often than in others.

Influence upon Tubes and Ovaries.—The larger the uterine tumors the more likelihood of consequent disease of the tubes. There is often an endosalpingitis of the so-called catarrhal type, which usually affects both tubes. It is characterized by casting off of epithelium, swelling of folds of the mucous membrane, hemorrhages into the tissues of the mucosa, edema and exudation therein. Often there is a sort of interstitial salpingitis with thickening of the walls of the tubes. All these changes can be explained by the influence of passive congestion and interference with the vascular supply of the tubes because of the growth of the uterine tumor.

The *ovaries* may be more or less affected by uterine fibroids. There is often an increase in thickness of the ovary, partly from hyperplasia of the follicles and partly from hyperplasia of the stroma. The stroma becomes infiltrated with round cells, the vessels show hyaline degeneration and often show narrowed lumens. Often many of the primordial follicles disappear. The tubes and ovaries may be distorted by traction of the growing tumor.

Influence upon the Heart.—Fatty degeneration and brown atrophy of the cardiac muscle have often been noted at autopsies of women who have had uterine fibroids, especially of considerable size. Clinically one not infrequently observes a heightened blood pressure, a slight enlargement of the heart's area of dullness, and sometimes a functional murmur.

DEGENERATIVE CHANGES

Myomata are especially liable to various degenerative changes and infiltrations. These are mostly in the line of *disturbances of nutrition.*

Atrophy.—If the nutrition of the tumor is diminished by reason of any physiological involution of the genital system, such as the puerperium, the climacteric, lactation, or the abnormal condition of

castration, the tumor may undergo atrophy. The muscle cells become smaller and fewer in number, may even become partly fatty, the connective tissue gets the upper hand, and changes the neoplasm into a dense, firm, callous mass, something after the manner of cicatricial formation. Even large tumors may sometimes be much diminished in size.

Fatty Degeneration.—This change is very frequent, especially in the submucous and intramural types. The subserous tumors tend more to hardening processes. The tumor mass becomes a little softer than before and the cut surface shows minute flakes of yellowish fatty tissue. The fat drops appear first near the nuclei, later throughout the cell.

This fatty degeneration comes especially with *pregnancy*. Sometimes even a large tumor becomes reduced almost to an imperceptible one after the end of the puerperium. The fibromyomatous tissue seems to partake, with the musculature of the uterus, of the fatty changes which are normal to the puerperal uterus.

Amyloid Degeneration.—In the presence of a general amyloid condition, the uterine muscle and also the tissues of a fibromyoma may undergo the same degeneration.

Calcareous Infiltration.—Calcareous changes in the substance of a fibroid tumor often mark high degrees of atrophy. As in other instances of connective tissue hypertrophy and of cicatricial formation, so an atrophic fibroid may become the seat of deposits of lime salts. In some cases the whole tumor may become so infiltrated that it appears like a piece of limestone. Such are the so-called uterine stones.

Myxomatous Degeneration.—Mucoid change in the tumors, to a limited extent, is not uncommon; less common in the subserous than in the other types. It begins as a softening of the tissues, whereby the intercellular substance diminishes markedly and gives place to a gelatinous material containing mucin. The tumor becomes very soft to the touch, almost cystic.

The cut surface gives the appearance as of transparent spongy substance containing a gelatinous fluid. Often the myxomatous degeneration becomes localized by metamorphosis of the connective tissue into mucoid material so that cysts are formed in the substance of the tumor. Most cystic fibromyomata, so-called, are of this variety,—not true cysts, but rather localized mucoid softening.

Maceration and Necrosis.—Sudden and acute failure of nutrition may cause maceration of the tissues of the fibroid. Because the supply of nutriment comes by way of the peripheral vessels, the disturbance of this supply affects first and most the central parts of the tumor. The changes resemble those in a macerated fetus which has died in utero, but which has not yet been infected by bacteria.

The tissues become soft and watery; the color becomes reddish brown from the decomposition of the red blood corpuscles and consequent diffusion of hemoglobin. The cells lose their staining qualities. From the central to the peripheral parts of the tumor progressive degrees of necrosis are seen in the cells and the intercellular substance.

Infection, Gangrene, and Abscess.—A necrotic and macerated tumor becomes an easy prey to microbic invasion from the surrounding intestines, from the uterine cavity, and from the blood. The first effect of such infection is an infiltration of leucocytes caused by the irritation of the microbic toxins and the reaction thereto. Submucous polypoid tumors are more likely to be thus infected by extension of endometritis into them. Subserous fibroids may become adherent to intestine or to infected tubes and receive infection therefrom. Miscarriage or labor may be the cause of the infection. The tissues of the tumor are not especially well nourished and are therefore easily infected by chance microbes.

Local hemorrhages into the connective tissue spaces of the tumor may be starting points for infection. Abscesses may localize in the course of aseptic infection arising from any cause. Gangrene may result from maceration and necrosis following twisting of a pedicle, incarceration, traumatism, or from any cause which diminishes the supply of nutriment to the tumor.

Vascular Disturbances.—*Thrombotic* vessels are frequent in the substance of fibromyomata. Visible causes for such thromboses are often not found. The result is edema of the portion of the tumor supplied by the thrombotic vessels, a sort of infarct. Other degenerative changes may follow.

Telangiectasis, dilatation of blood or lymph vessels, may occur. In these cases the tumor becomes riddled with enlarged blood or lymphatic spaces lined with the endothelium of the vessel. Some of the spaces may be large so that cystic cavities appear in its substance.

Clinical Manifestations

Hemorrhage is the foremost of the typical symptoms. It is first noted as menstrual flow, increased in amount and duration. Later bleeding between the menstrual periods occurs. Clots are often expelled, sometimes accompanied by painful uterine contractions. The hemorrhages are seldom individually threatening to life, but frequent repetition of moderate losses of blood is very likely to cause marked anemia.

The *cause of the bleeding* lies in the chronic hyperplasia of the endometrium. Rarely is there dangerous hemorrhage from the ulcerated places or from vessels of the tumor itself. The climacteric sometimes marks a diminution of the bleeding, but more often the menopause is delayed until far into the fifth decade of life. After the apparent establishment of the change of life a fibromyoma will often cause frequently recurring hemorrhages.

The *anemia* is often grave. The pulse becomes weak and fast. The hemoglobin percentage falls below fifty, often even to thirty.

Pain is not usually an early symptom. It is first manifested in the form of *dysmenorrhea*. Often pain and menorrhagia due to a small unrecognized fibroid are treated by curettage with disappointing results. Later bimanual examination will reveal a growing fibromyoma. Sometimes the pains are very severe and have the intermittent characteristic of the pains of abortion or of labor. The probable cause of these distressing manifestations is the menstrual swelling of both uterus and myoma. Sometimes the cramping pains are due to attempts of the uterus to expel a submucous fibroid polyp.

Pressure symptoms develop as the tumor grows large enough to crowd the pelvis. The pressure is first noted upon the bladder, causing urinary tenesmus, frequent micturition, or retention. The rectum next becomes compressed by the growth, rectal pain ensues and hemorrhoids develop as a rule. Later, as the tumor fills the pelvic cavity, the plexus of nerves in the posterior part of the pelvis is compressed and severe pain results.

In a few instances, the ureters are occluded wholly or partially, so that hydronephrosis results. Edema of the feet, ankles, and legs results from interference with venous return.

Torsion of the pedicle of a subserous myoma or of the whole uterus, in cases of intramural type, usually causes severe and sudden pain

accompanied by signs of shock. The pain is usually referred to the middle of the abdomen just below the umbilicus.

Sterility is common enough in fibromyomatous cases to have diagnostic value. A history of sterility in spite of frequent exposure to conception is very often obtained from these patients. On the other hand, pregnancy seems to be favorable to the growth of these tumors. Subsidence after the puerperium is not rare. In many

Fig. 146.—Myomatous uterus. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

instances, the myoma starts to grow again after a few months or years.

Pregnancy is by no means incompatible with the growth of uterine fibroids. Early abortion is to be looked for where the tumors are many or large, and especially where the uterus is much distorted by their presence. The diagnosis of fibromyoma is often made, but the coincident pregnancy is difficult to distinguish. Therefore, the ovum is often removed with the myomatous uterus.

If the *pregnancy goes on to full term*, the dangers of the labor are no longer considered by most authorities as threatening as they were formerly supposed to be. The tumors in the wall of the uterus seem to adapt themselves to the growing organ and flatten out so as to minimize the deleterious effect upon the pregnancy. In such pregnancies there is a greater proportion of malformations of the fetus than in normal cases. Rupture of the uterus at the time of labor is a rather remote danger. Because of the interference of the tumors, the muscular action of the uterus is hampered and the labors are likely to be prolonged from uterine inertia.

DIAGNOSIS

In the majority of cases, a fibromyoma larger than a walnut can be palpated under bimanual examination unless the patient is very fat or has rigid abdominal walls. The nodular effect of multiple fibroids is characteristic. The tumor tissue is usually harder to the feeling than normal uterine tissue.

The diagnosis is made from history, sterility, age, hemorrhages, pain, palpation, and bimanual examination. Fibromyoma is to be *differentiated* from ovarian tumors, from tubal or ovarian abscesses, from parametritic exudates, from adenoma of the uterine body, and from pregnancy.

Ovarian tumors of the solid variety are usually bilateral, freely movable and distinct from the uterus unless adherent. A subserous tumor with a long pedicle is hard to distinguish unless the two ovaries can be made out in addition. Cysts of the ovary, except dermoids, usually fluctuate, rise higher into the pelvis or abdomen and take origin from the site of the ovary on one side of the pelvis.

Tubal or ovarian abscesses are distinguished by the history of former infection, either gonorrheal or puerperal, by fever or leucocytosis, by tenderness on pressure or on examination, and by their situation behind and to one side or both sides of the uterus. They can usually be felt to be distinct from the uterus. The mass of the infected tubes and ovaries is usually adherent to the pelvic wall and less movable than a subserous fibroid or a myomatous uterus.

Exudates in the broad ligament or parametrium are distinguished by history of infection (usually postabortum or postpartum), marked tenderness on pressure, fever, leucocytosis, the situation towards the side of the pelvis, and almost complete immobility. These

exudates usually do not feel so hard as fibroids of the broad ligament, but fluctuate or have a boggy feeling.

Adenoma of the body of the uterus which has reached considerable size is softer than fibromyoma of the wall and causes a symmetrical enlargement of the uterus. It rarely grows to a size as great as that of intramural fibroid. There is only one tumor to be felt, and that is the enlarged uterus itself. There are none of the nodules usually felt in the uterus when a fibroid is present in it. Usually when one fibromyoma is present there are also others of smaller size.

Pregnancy is often difficult to distinguish from intramural fibromyoma. Since the treatment of the two conditions is so widely at variance, it is important to make a differential diagnosis. Cessation of menses is the rule in pregnancy; menorrhagia or intermittent hemorrhages in fibroids. In the case of a woman near the menopause, however, the amenorrhea may not mean pregnancy, and fibromyoma does not always cause hemorrhages. In cases of multiple fibroids, the nodules may be taken for fetal small parts.

History is an important element. The early signs of pregnancy are absent in fibroids. The growth is progressive and at the regular rate in pregnancy, while in fibroids the period during which the enlargement of the abdomen has been noted is usually longer than in pregnancy. The fetal movements, ballottement, fetal heart tones, and palpation of fetal parts are characteristic of pregnancy.

Since it is rarely necessary to operate at once for fibromyoma, one can usually wait until the positive signs of pregnancy have shown themselves or even until labor has occurred or has failed to occur after the usual period of gestation.

Prognosis

In respect to *life* and on the part of the fibromyoma itself, it must be agreed that the prognosis is *good*. We are not dealing with a malignant neoplasm, which of itself tends to destruction of life. It is true that a large number of women go through the latter half of life with a uterine fibroid of small size which never reveals itself except under examination for some other cause or even may not be discovered until the autopsy. In other words, we may say that fibroids that are not causing symptoms are usually small. These may never grow, and therefore may never cause any trouble.

The fact remains that most fibromyomata are discovered because symptoms have called for an examination. We never know when such tumors may grow larger and cause symptoms more disagreeable or even severe. The extent of the symptoms depends largely upon the size and the location of the fibroid. The longer we wait the more severe becomes the operation necessary for its removal.

Pregnancy which goes to full term is relatively so uncommon in a fibroid uterus that the woman's desire to become pregnant and bear a child, while worthy of some consideration, is small reason for delaying rational treatment. The changes in the endometrium caused by the presence of the growth are likely to increase. The distortion of the upper uterine cavity is likely to increase as the tumor or tumors increase in size.

While the *growths are still small*, simple myomectomy may suffice to restore the uterus to a normal condition, and even to a possibility of normal child-bearing. Hysterectomy is much easier and causes less shock to the patient when the uterus is small and when no adhesions have formed.

When the fibromyomatous *uterus has become large*, the likelihood of dangerous adhesions has increased, the blood vessels supplying it are enormously enlarged, and consequently the dangers from hemorrhage, shock, and infection are greatly enhanced.

The chance is great that degenerations, severe symptoms, or complications will ensue. When these complications come, the dangers from operation are multiplied. A large part of even the low mortality of myoma operations is due to the fact that so many operations are undertaken only after the complications are present. The mortality, under modern conditions, of early operation, undertaken before complications ensue and while the tumor is yet small, is infinitesimal.

A. Martin found, in the Greifswald clinic, in a series of 408 cases during seven years, that the myoma was purulent 21 times; cystic, 12 times; telangiectatic, 12 times; and sarcomatous, 9 times. The uterus itself was also the seat of carcinoma in 15 instances. The adnexa showed complications mostly attributable to the myoma 44 times; 11 times pyosalpinx; once, hydrosalpinx; 4 times, tuboovarian tumors; 19 times, ovarian tumors; 3 times, large hematomata of the ovarian follicles; twice, carcinoma, and once, abscess of the ovary;

and 3 times, teratoma of the ovary. Doederlein found in 200 cases 102 which presented complications within or without the tumor.

Anemia due to frequent hemorrhages from the endometrium of the fibromyomatous uterus usually, itself, calls for interference. While many cases present no imminent danger to life, yet the presence of the tumors causes invalidism from which the patient seeks relief. The sooner the treatment is given, the better is the condition of the patient and the better the prognosis. For these reasons, we have come to agree with those who recommend operative treatment for fibromyoma of the uterus as soon as convenient after the diagnosis has been made.

Treatment

Medical.—Medical treatment is advisable only for palliation, and as preparation for operation. If the woman is so anemic that immediate operation appears dangerous, one must put her to bed and endeavor to stop the hemorrhage. Rest in a horizontal position or with the foot of the bed slightly elevated will often suffice. Sometimes small doses of ergot will stop the bleeding; in many cases one must pack the cervix and vagina. Meanwhile generous and easily digested diet, such as would be indicated in debility and anemia in general, must be enforced.

Radiotherapy, especially the massive x-ray treatment, has entered the field to contend with the operative treatment. If all the distressing symptoms are relieved and the tumor is decreased in size to a marked degree, and if time shall prove that it does not start to grow again, and if the complications disappear not to return, then radiotherapy will have secured its place as a preferable treatment and will maintain it. At present the method is undergoing trial. We are inclined to believe that the second edition of this book will refer to it as one of the methods tried and found wanting, like the ergot treatment, the iodine and iodide treatments, and the treatment by the electric needle of Apostoli.

Operation.—Surgery is still the method of choice in the treatment of fibromyoma of the uterus. There are two methods of attack in these operations; by the vaginal, and by the abdominal routes. Operations by the vaginal route include vaginal myomectomy and vaginal hysterectomy. Those by the abdominal route include castration, myomectomy, subtotal hysterectomy (supracervical amputa-

tion of uterus), total hysterectomy, and ligature of the ovarian or uterine arteries.

VAGINAL MYOMECTOMY is adapted to removal of myomata of the cervix which are situated low, and are easily accessible. It is not indicated unless the operator can be reasonably sure that there are no more tumors within the body of the uterus.

A form of vaginal myomectomy recently much vaunted by German and Austrian authorities, but now happily almost forgotten, is performed by opening the posterior fornix of the vagina into the
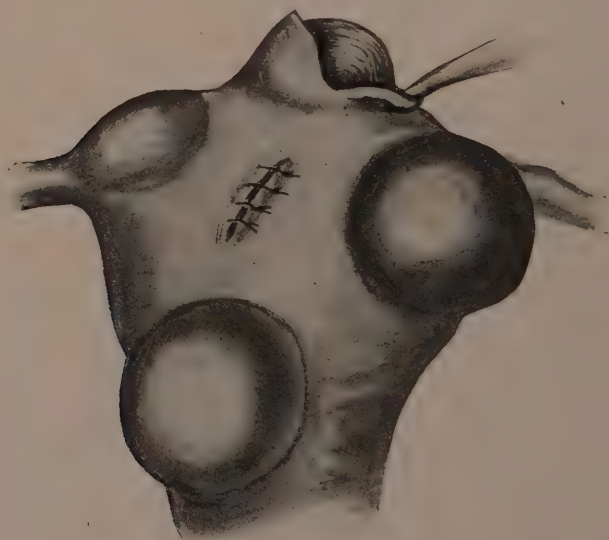
Fig. 147.—Enucleation of subserous uterine myoma.

cul-de-sac of Douglas and, with a longhandled curved triangular knife, cutting out piecemeal a myoma of the posterior uterine wall. The method has nothing to recommend it, and much to condemn it.

VAGINAL HYSTERECTOMY is adapted to the treatment of small fibroids, especially where there may be suspicion of adenocarcinoma of the uterus, or where one or more of the tumors may be low in the uterus or in the cervix. It is performed as already described in the section on Carcinoma.

CASTRATION in the treatment of fibromyoma is a relic of the dark ages of surgery, when it was considered dangerous to perform hys-

terectomy. Its rationale depended upon the idea that the menopause causes retrogression of the tumors. The intent was to secure an artificial menopause by removing the ovaries. Sometimes this is followed by diminution of the tumor and amelioration of the symptoms, but not often enough to cause the method to be recommended.

Castration may occasionally be advisable in cases of large tumor
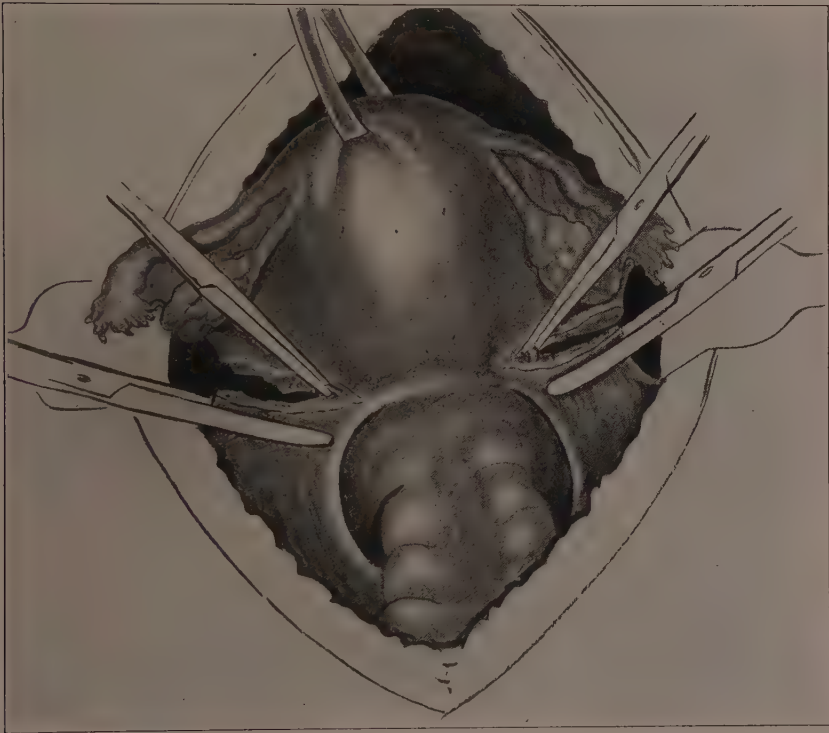
Fig. 148.—Supravaginal hysterectomy. Dividing broad ligaments and controlling hemorrhage.

with many and firm adhesions in a weak patient who would apparently be unable to survive such a severe operation as complete hysterectomy would be under the circumstances. It may be remarked in this connection that perhaps much of the benefit in x-ray treatment may be due to the destructive action of the rays on the internal secretion of the ovaries.

ABDOMINAL MYOMECTOMY is adapted for those myomatous uteri in

which the tumors are all subserous or at least near the outer surface of the organs. It is seldom advisable for strictly intramural fibroids. It is best adapted for tumors of the fundus, even for those of moderately large size.

The operation of myomectomy is not difficult. One makes an incision through the peritoneal coat and musculature down to the
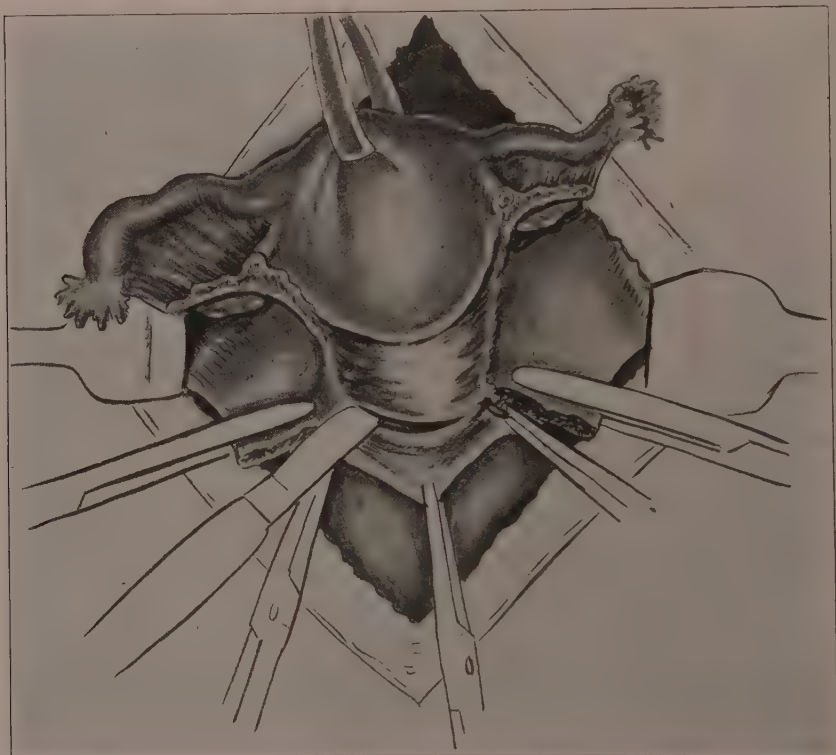
Fig. 149.—Supravaginal hysterectomy. Dividing cervix.

tumor tissue and through its capsule. Then, by blunt dissection, the tumor is shelled out. There is rarely much bleeding from the cavity, but if there is, it can easily be controlled by pressure forceps and ligatures. The walls of the cavity are brought together with buried catgut sutures to avoid dead spaces, and the peritoneal coat is united with fine catgut. This procedure is repeated for each of the tumors.

SUBTOTAL HYSTERECTOMY is the operation usually performed. The

operation may include removal of the tubes and ovaries or may leave them intact. There is often, especially in relatively young women, some advantage in preserving the internal secretion of the ovaries. If healthy, the tubes may be left.
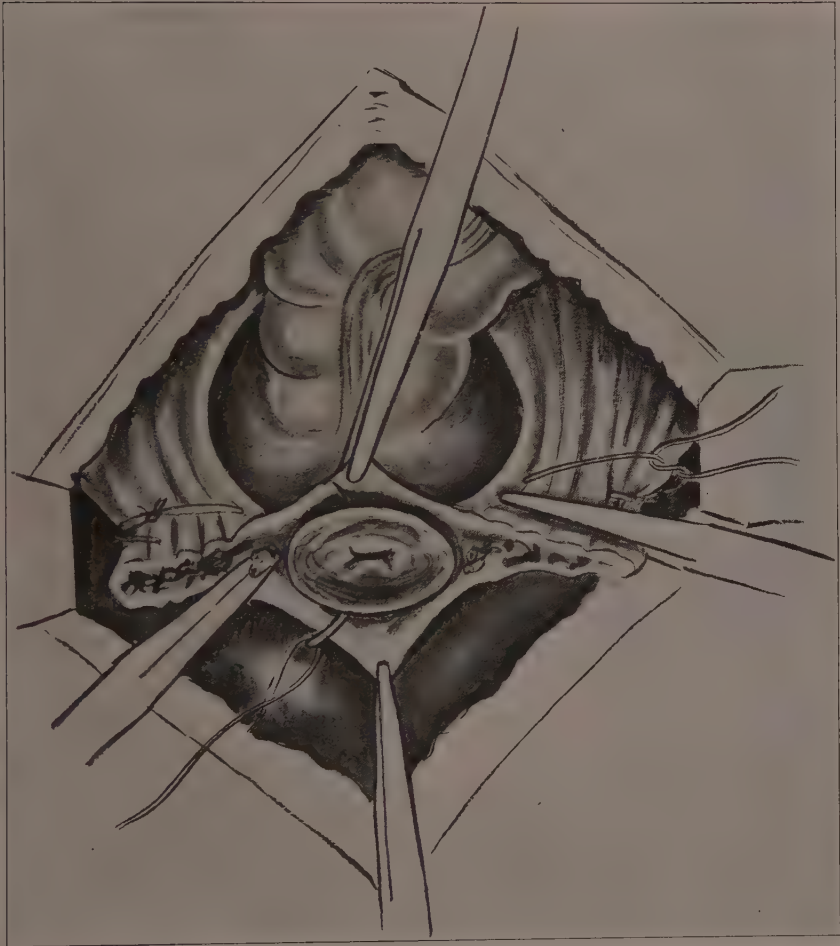
Fig. 150.—Supravaginal hysterectomy. Hemorrhage controlled, sutures being placed to close cervical wound.

If the adnexa are to be sacrificed, a ligature should be applied to the infundibulo-pelvic ligament on each side and the ligaments should be cut as far as secured. Then clamps or further ligatures

may be progressively applied to the broad ligaments until the cervix
is reached on either side and the tissues are cut as fast as secured.
It is usually easier to free the uterus from the broad ligament on one
side at a time.   If clamps are used they may be removed one at a
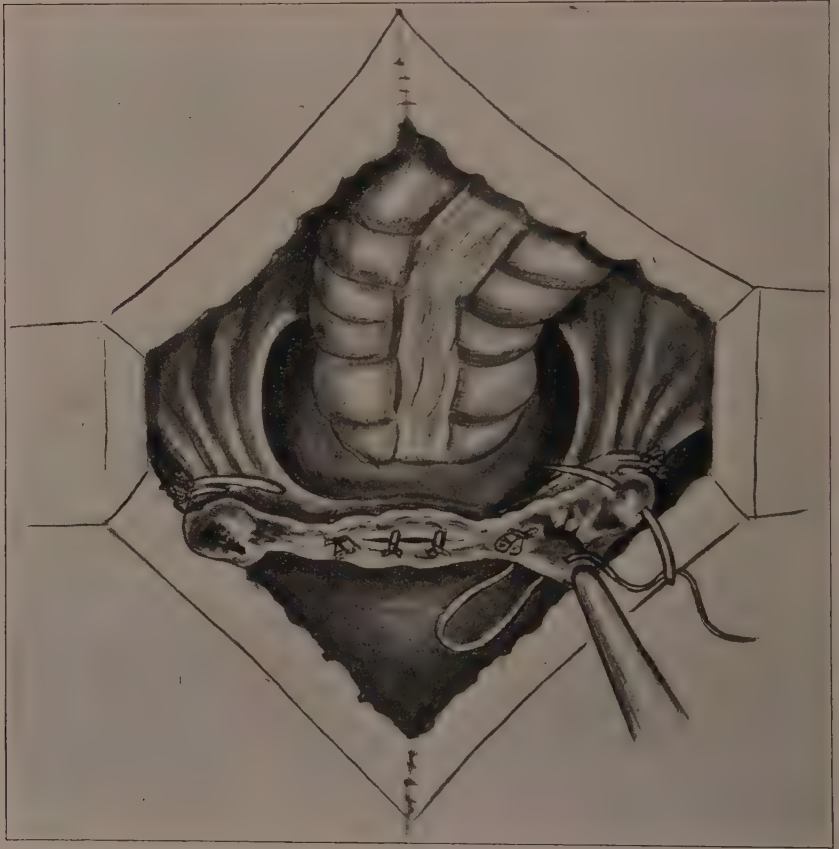
Fig. 151.—Supravaginal hysterectomy.   Cut edges of cervix approximated and suturing of
peritoneum commenced.

time and bleeding points secured by ligatures or the broad ligament
may be tied by mass sutures behind the clamps.

　　The uterus during the foregoing procedures has been raised out
of the pelvis and is left attached to the bladder and vagina.   An
incision curving upwards unites the broad ligament wounds across
the front of the uterus just above the bladder, and the peritoneum

and bladder are bluntly dissected downwards for a short distance
upon the cervix. A similar incision unites the broad ligament wounds
posteriorly by cutting through the peritoneum of the posterior wall
of the uterus. The cervix is then cut through by knife or scissors,
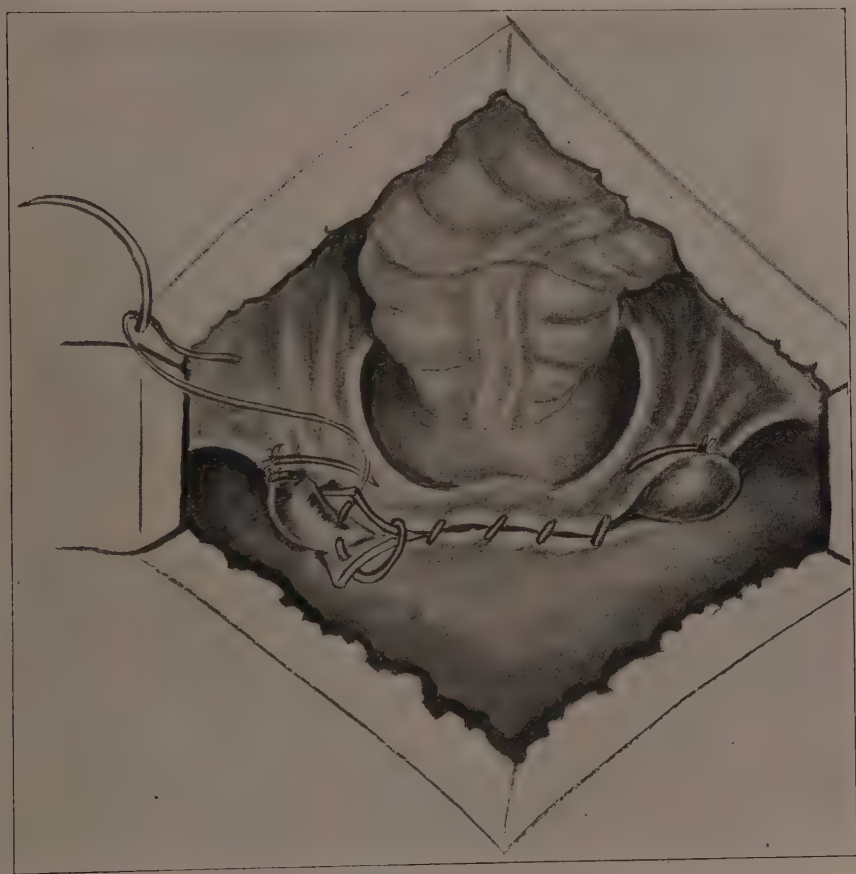
Fig. 152.—Supravaginal hysterectomy. Operation practically completed.

and the body of the uterus is thus removed. Vulsellas secure the
cervical stump, and any bleeding points are tied.

Then sutures on a strong but small curved needle are passed from
front to back and through the tissue of the cervix, including the peri-
toneum on both sides. The stumps of the round ligaments may be
included in these sutures in order to hold the cervix up in place.
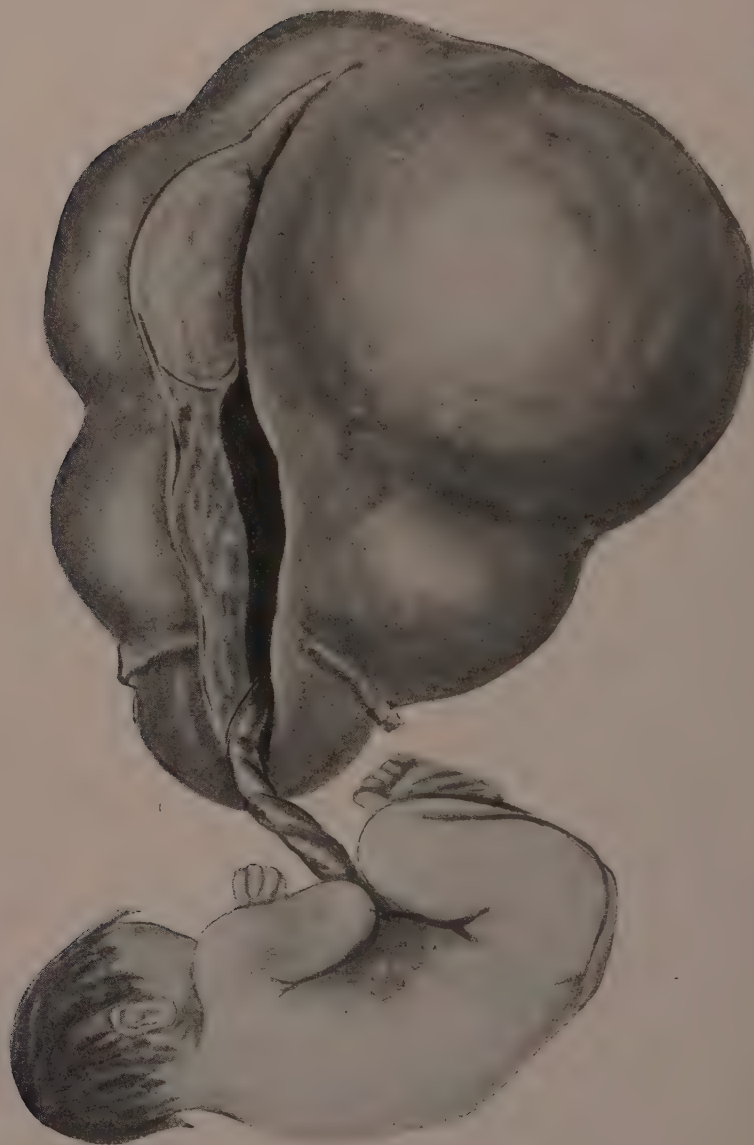
Fig. 153.—Fibromyoma of uterus complicating pregnancy. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

Finer sutures are whipped over the raw surfaces of the wounds in the broad ligaments in order to finish covering the pelvic floor with peritoneum.

If the adnexa have been left, the stumps of the broad and round ligaments and of the tubes are sutured into the stump of the cervix, thus closing the pelvic floor with peritoneum.

TOTAL ABDOMINAL HYSTERECTOMY is indicated when there is a fibroid in the cervix as well as in the body of the uterus, or when the portio vaginalis is the site of unhealed lacerations or hypertrophy. The operation is the same as above described except that the separation from the broad ligament and the bladder includes the whole cervix as far as its vaginal attachment. The posterior peritoneal incision goes through the sacrouterine ligaments, and into the vaginal vault. The closing sutures are made through the margins of the vaginal wound before and behind, and include the stumps of the ligaments.

LIGATURE OF THE ARTERIES supplying the uterus is seldom indicated, and then only when radical operation is impossible, for some special reason. If the tumor is large, or if there are many adhesions, the uterine arteries can seldom be safely reached by way of the abdomen. Size of tumor and dangerous adhesions would be the chief reasons why radical procedures could not be undertaken.

The *ovarian artery* is secured just below the uterine end of the tube, and a short distance outwards from the uterus. It can often be felt pulsating. The *uterine artery* can be secured at the base of the broad ligament a short distance from the cervix. Its pulsations should be felt as a guide, lest the ureter be wounded.

Adenomyoma of the Uterus

A special variety of myoma which contains glandular elements within its substance, is called adenomyoma. These elements may be derived from the neighboring *glands of the endometrium*. In this sort of adenomyoma the glands either grow into the substance of the myoma like an endogenous adenoma or are included within it as the growing tumor encloses endometrium at some of the natural or distorted folds of the uterine cavity. Adenomyoma is almost always intramural in type. It is usually situated in the posterior wall.

Another and perhaps commoner source of the glands in the adeno-

myoma is embryonal *remains of Gartner's ducts*. They may also be derived from misplaced portions of *wolffian bodies* or from misplaced *muellerian ducts*. Sometimes the tumors have an appearance which strongly suggests kidney tissue. The glandular tubules often become dilated into sizable cysts. Malignant metamorphosis of the epithelium of the glands within the fibromyoma may result in fibrocarcinoma.

Women who suffer from adenomyoma of the uterus are usually weaker than those who have a usual type of fibroid. They are often anemic, sometimes tuberculous, chlorotic, and suffer from dysmenorrhea. They often have symptoms of pelvic peritonitis, local pains, and tenderness on pressure over the tumor. Painful coitus is more common than with ordinary fibromyoma. They are likely to have signs of defective development of the genitals in general, such as short and narrow vagina, undeveloped breasts, less rounded contour of the body than normal women, and contracted pelvis.

UNCOMMON SOLID NEOPLASMS

Lipoma

A lipoma is composed of adipose tissue, usually arising from the normal fat of the locality. It is merely a local hyperplasia of fatty tissue which grows into the shape of a sessile or pedunculated tumor. In the female genital system it occurs in the labia majora, in the clitoris, and in the breast.

The *structure* is lobulated. The lobules of adipose tissue are interwoven with trabeculæ of more or less dense connective tissue. These trabeculæ are exaggerations of the normal connective tissue supporting the subcutaneous framework.

The tumor may be as small as a cherry, or may reach the size of a cocoanut, hanging down between the thighs or from the breast. It causes inconvenience only because of interference with locomotion or with the clothing. The surface is covered by somewhat thickened skin, and may become ulcerated from maceration or from pressure.

If its presence is inconvenient, the tumor should be removed by dissection.

Elephantiasis

Elephantiasis is a rare disease of the female genitals. It sometimes occurs in the labia minora. The gross appearance is that of

a thickening and hypertrophy of the labia which causes them to protrude from the vulva and sometimes to hang down between the thighs. There is edema of the connective tissue of the affected part and enlargement of the lymph vessels. The surface sometimes becomes eroded or ulcerated from the effect of urine and secretions and from external trauma.

Fig. 154.—Lymph stasis of vulva, secondary to bilateral suppurative inguinal adenitis.

A condition resembling vulvar elephantiasis may follow bilateral obstruction of the inguinal lymphatics on account of abscess formation. It occurs not infrequently in young prostitutes.

If annoying on account of size or interference with the functions of the vulva, the *labia may be amputated.*

Sarcoma

Pathology.—Sarcoma is the typical malignant neoplasm of the mesoblastic variety. It occurs oftener in the young than in the aged. Its cells undergo even more rapid proliferation than those of carcinoma.

Histologically there are *three general types of sarcoma*: the small round-celled, the large round-celled, and the spindle-celled. The connective tissue framework of sarcoma is usually less in evidence than that of carcinoma. On account of rapid proliferation of nuclei, giant cells are common.

The sarcoma which arises from the epithelioid cells of the capillaries and lymph vessels resembles carcinoma in appearance. It is distinguished by its relation to the vessels. It is often called *endothelioma.* Endothelioma arising from the endothelium of the lymph channels which surround blood vessels is sometimes called *perithelioma.*

Blood *metastasis* in sarcoma is rather more frequent than lymphatic metastasis. The clinical manifestations, especially in the uterus, are similar to those of carcinoma and the treatment is the same.

Sarcoma of the uterus is manifested in the connective tissue portion of the endometrium and in the fibromuscular structure of the uterus. In the former, the cell type is more that of the round cell, and in the latter of the spindle cell. The spindle form is found in sarcomatous metamorphosis of a uterine fibromyoma. Sarcoma is a very rare neoplasm of the uterus, or indeed of any part of the female genitals. Herzog states that he has seen in many thousand autopsies, only three cases of sarcoma of the uterus.

Clinical Course.—The symptoms and clinical course of sarcoma in the female are similar to those of carcinoma in the same locality. The diagnosis is seldom made, or indeed even suspected, until a microscopic examination of sections or curetted tissues has been made. Sarcomatous metamorphosis of the interior of an intramural fibroid is

sometimes indicated by a rather rapid softening of the tumor, without symptoms which would point to maceration and infection.

Prognosis.—The prognosis is as bad as that of carcinoma. Its growth is often more rapid, the hemorrhages more severe, and the metastases earlier and more distant. As a rule the round-celled sarcoma is more rapid in growth than the spindle-celled. The presence of giant cells usually indicates rapid proliferation and consequently is a bad prognostic mark.

If a sarcoma does not recur within a year after operation, a *recurrence* is seldom to be feared afterwards.

Treatment.—Like most other malignant disease, sarcoma must be treated by *early removal*, unless the case is already inoperable.

Palliative treatment of inoperable cases is conducted along the same lines as in carcinoma. Coley's treatment by inoculation with cultures of the streptococcus from erysipelas cases, combined with bacillus prodigiosus, seemed to obtain some success with sarcoma and is still occasionally used as a forlorn hope.

Sarcoma of the tube and ovary has been observed. In the former, the type is usually round-celled, and in the latter spindle-celled. Endothelioma may occur in the ovary.

Sarcoma originating in the connective tissue under the peritoneum of the posterior wall of the pelvis (retroperitoneal sarcoma) is rather more frequent than that originating in the tissues of the female genitals. It usually occurs in youth or childhood. The tumor may fill the pelvis and cause pressure symptoms in the organs contained therein.

CHAPTER XVI

NEOPLASMS (Cont'd)

CYSTS

Considered strictly as a neoplasm, a *cystoma* would be limited to a bladder-like new growth composed of an epithelial lining, a capsular connective tissue wall, and fluid contents secreted by the epithelium. Therefore true cystoma would include only the cystadenomata of the ovary, embryomata, and certain cystic growths of the muellerian and wolffian remains which occur in the posterior walls of the vagina and uterus, and in the broad ligament. For practical purposes, the term cyst has come to indicate any rather thin-walled tumor containing fluid.

Classification

Cysts are often classified as cystadenoma, embryoma (dermoid), developmental cyst, retention cyst, and degeneration cyst.

Cystadenoma is a true neoplasm whose usual origin is from the epithelium of Pflüger's columns or at least from the germ epithelium of the ovary. It consists of an immense hyperplasia of these epithelial cells taking on a glandular formation. The connective tissue stroma of the ovary composes the wall of the cyst, and the embryonic epithelium constitutes the lining. The excessive overgrowth of the epithelium may cause papillary formations of the glandular structures (papillary cystadenoma). The fluid contents of the cyst are composed of mucoid or other secretion due to the activity of the glandular cells, as well as of serum from the surrounding blood vessels. There may be one cyst (unilocular) or the tumor may be composed of many cysts of varying sizes (multilocular).

Embryomata represent included remnants of a twin, or a parthenogenetic embryo. Such tumors are commonly called *dermoids,* because of the preponderance of integumentary structures in the composition of most of them. Teratomata or teratoid tumors are also embryomata.

Developmental cysts arise from the epithelial lining of the par-

ovarium, paroophoron, and other remnants of embryonic ducts and tubules representing primitive kidney structures. The cells proliferate, secrete fluid, and develop into the lining of cystic cavities. These primordial tubules are found in the region of the ovarian ligament, the broad ligament, very rarely in the posterior wall of the uterus, more often in the posterior wall of the vagina.

Retention cysts are not true neoplasms but are caused by occlusion of a glandular duct and consequent distention of the glandular cavity by the retained secretions. Such retention cysts are exemplified in the ovula Nabothi of the chronically infected cervix, cysts of the vulvovaginal glands (Bartholin's), hydrosalpinx, and cysts of the graafian follicles and the corpora lutea. Cysts of the follicles and corpora lutea are retention cysts in the sense that they do not rupture or, having ruptured, close up again; not in the sense that the duct becomes occluded.

Degeneration cysts are cavities which are formed by liquefaction of degenerated tissues. Such are exemplified in certain forms of cystic fibroid of the uterus filled with colloid, mucoid, or serous material or by spaces in the tissues of other organs filled with similar material. In a certain sense, an abscess is a degeneration cyst filled with pus.

Since the symptoms and the treatment of cystic tumors depend largely upon the locality, it is convenient to classify cysts according to the locality or organ wherein they are found. Certain kinds of cyst are found mostly or exclusively in certain organs or localities.

OVARIAN CYSTS

Cysts of the ovary may be of any of the kinds already enumerated. Cystadenomata and embryomata are seldom seen anywhere else; developmental and degeneration cysts seldom occur in the ovary, while retention cysts of the graafian follicles and the primordial follicles are among the commonest tumors of that organ.

Cystadenoma

Glandular cystic tumors of the ovary are of two general varieties; cystadenoma pseudomucinosum, and cystadenoma serosum. Both may be papillary in varying degrees, papillary cystadenomata.

CYSTADENOMA PSEUDOMUCINOSUM

Pseudomucinous cystadenomata are among the commonest of the true neoplasms of the ovary, and tend to become the largest of all human tumors. In the olden days, when abdominal surgery was rare, reports teem with cases of ovarian cysts of this kind which weighed

Fig. 155.—Multilocular pseudomucinous cyst of ovary. *A.* Diagram showing structure of lining epithelium. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

from twenty to one hundred pounds. McDowell, the father of abdominal surgery, did his first work on cysts of this variety. These tumors are now seldom allowed to attain such dimensions before they fall under the operator's knife.

Etiology.—These cysts occur most often in women between the ages of thirty and fifty. Unmarried and childless women seem more

likely to suffer from them. Olshausen thought that uninterrupted menstruation and ovulation may stimulate the growth of such tumors. The temporary interruption caused by pregnancy and lactation may be a protection against their formation.

The ultimate histogenesis of both varieties of cystadenoma is disputed, and is largely of theoretical interest, under the present limitations of our knowledge. Waldeyer's theory is that the cells of Pflüger's columns, instead of going on to the formation of normal primordial follicles in the embryonic period, become diverted to form the beginnings of cystomata, or else there is a renewed growth of the germinal epithelium during extrauterine life.

Steffeck observed ova of normal appearance in some of the smallest daughter cysts of a cystadenoma. He therefore considers that the origin of these cystadenomata lies in the proliferation of the epithelium of the primordial follicles.

Daughter cysts probably arise from gland-like infoldings of the cyst wall, cicatricial closure of the openings, and thus retention of the secretion within the new cysts.

Pathological Anatomy.—The cysts are almost always multilocular by the time they are observed, indeed, probably they arise from several follicles and are multilocular from the beginning. The individual cysts vary in size from a pea to an adult head. The whole tumor has an irregular oval shape and a nodular surface, each nodule representing a cyst. The tumors are usually unilateral, involving only one ovary.

Rupture of the intracystic septa is common, leaving falciform folds in the wall and trabeculæ across the cavity.

The contents of pseudomucinous cysts are a mucoid substance which seems to resemble true mucus and albumin, giving some of the reactions of each. This substance has been called pseudomucin and is classed as a glycoproteid or metalbumen. Like mucus, it varies in consistency from soft jelly to water, thus resembling true mucus. In different sections of the general cyst, the contents of the daughter cysts will vary. The fluid may be clear or may be clouded by fatty deposits, cholesterin, granular detritus and leucocytes, or may be colored by blood pigment. It is derived from the epithelium by secretion and is in no sense a degeneration product.

The tendency is for the lining of the cysts to extend by infoldings

in *gland-like formations*, from the cyst wall outwards (*evertens*). Sometimes the lining of the cyst becomes thrown into folds which project into the cavity of the cyst in *papillary formation* (*invertens.*)

Pathological Histology.—The wall of the cystoma consists of three layers. The outer layer is composed of the germ epithelial layer of the ovary. The middle one is composed of connective tissue, varying in density and derived from the ovarian stroma. The inner lining is composed of a columnar epithelium resembling that of the endometrium. The epithelial lining is often thrown up into small folds projecting into the cavity, but not into extensive papillæ. Sections of the wall of a larger cyst often show extensions into smaller daughter cysts, often of minute size.

Among the epithelial cells lining the walls are numerous "goblet" cells which secrete the pseudomucin. Where the cysts are large or where there is much pressure upon the wall from the contained secretion, the cells lose their columnar character, become cuboidal, flat, or are destroyed altogether.

When the cellular proliferation of the epithelium of a cyst increases so as to get the upper hand of the secretion, the cyst cavity becomes filled with the papillary projections due to folding into the cyst of the hyperplastic membrane. This is the invertens type. It is less common in the pseudomucinous cyst than in the serous cysts.

The pseudomucinous cyst is distinctly of a *benign type*. It has only one layer of epithelial cells in its lining; the layers are not placed back-to-back with the intervention of a minute amount of connective tissue; there is seldom found any evidence of excessive proliferation, such as giant-cell growth, abnormal mitotic figures, or necrosis. There is no tendency to recurrence after extirpation and no metastasis, either lymphatic or hemic. Rarely there is implantation of small cysts upon the adjacent peritoneum, but this has no malignant characteristics.

Cystadenoma Serosum

Etiology.—Serous cystoma of the ovary is about one-third as frequent as the pseudomucinous variety. It occurs about the same ages. The tumors are usually not so large. It is more common in nulliparæ than in multiparæ.

The *tumor arises* from proliferation of the germinal epithelium

or of the epithelium of the primordial follicles. The cells develop
into long columnar epithelial cells with cilia. They resemble the
cells of the tubal epithelium.

There is much controversy as to whence come the *ciliated epithelial
cells,* cells which are foreign to any normally found in the ovary.
Indeed many doubt their origin within the ovary, and consider them
to arise from displaced remains of tubules of the primordial kidney
organs.

Others consider that they arise from the epithelium of the fallo-

Fig. 156.—Papillary cystadenoma serosum of ovary. (From specimen in Obstetric and
Gynecologic Museum, Loyola University School of Medicine.)

pian tube, especially of the fimbria ovarica. These cells may be-
come drawn into the ovary or displaced within it during develop-
ment, and may there undergo proliferation and start the cystad-
enoma.

It must not be forgotten that the tubal epithelium itself is a
descendant of the germ epithelium of the genital ridge in the em-
bryo, as is the parenchyma of the ovary. If one can develop cilia
normally, perhaps the other can under certain abnormal conditions.

Pathological Anatomy.—Serous cystadenoma of the evertens type
is extremely rare. The cystadenoma serosum invertens is the com-

mon *papillary serous cystoma* of the ovary. The tumor is almost always multilocular; the different sections vary immensely in size.

The *cystic contents* are composed of serum resembling that of the blood. This may be clear, clouded by fatty and degenerative products, or colored by blood pigments. In the larger cysts of one of these cystic tumors the fluid contents are often of a chocolate color, due to metamorphosed blood.

Within the cavities are masses of *papillæ* due to the extensive

Fig. 157.—Papillary cystadenoma serosum of ovary. *A.* Diagram showing structure of lining epithelium.

proliferation of the lining membrane, which is thrown into villous projections. Some of the cystic cavities may be almost filled with these soft villous masses. Often some will burst and the papillæ will grow out in the free peritoneal cavity. In such cases ascites is always present to a marked degree. The ascitic fluid is often stained with blood pigments. Sometimes there are implantations of papillary masses upon various places in the peritoneal coat of the pelvic and abdominal viscera and of the parieties.

Pathological Histology.—Like the pseudomucinous cyst, the papillary serous cyst has an outer layer covered with the germinal epithelium, an inner connective tissue layer, and the lining composed of a single layer of long columnar ciliated epithelial cells. The rapid proliferation of these cells causes them, with a supporting framework of connective tissue, to extend into the cavity of the cyst as many branching villi.
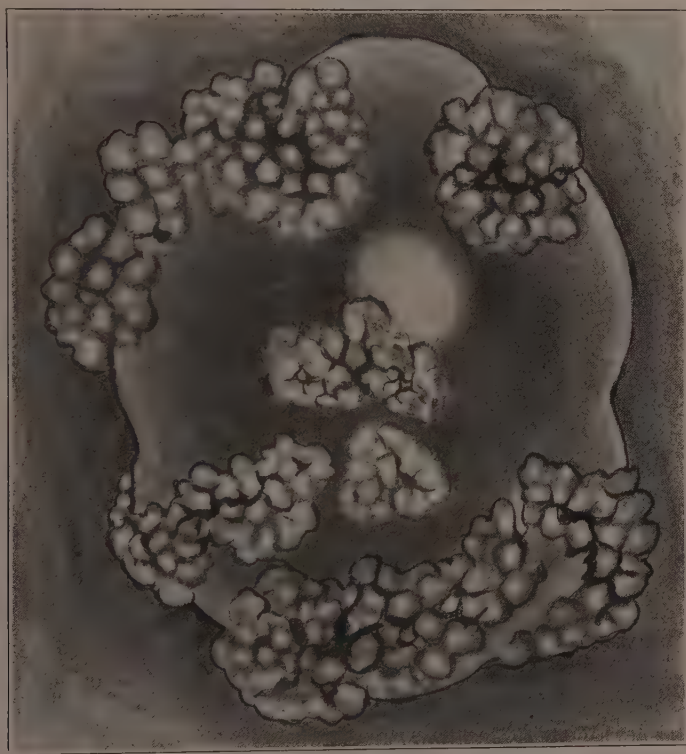
Fig. 158.—Papillary cystadenoma of ovary.

The neoplasm is generally considered a *benign* tumor, but nevertheless it presents some characteristics which make it resemble a *malignant* growth. These are close apposition of the epithelial cells of the papillæ back-to-back upon the villi with the intervention of little connective tissue, frequency of growth into the broad ligament, marked tendency of the papillæ to become implanted upon

the peritoneum and within the cicatrix of the operative wound to a degree almost tantamount to metastasis and recurrence.

Many of these serous papillary cystadenomata are close to the border ground of malignancy, and some are distinctly malignant.

Embryomata—Teratoid Tumors—Dermoid Cysts

ETIOLOGY

The dermoid cyst of the ovary is a cystic form of teratoma or embryoma. A *teratoma* is a tumor which exhibits the character of
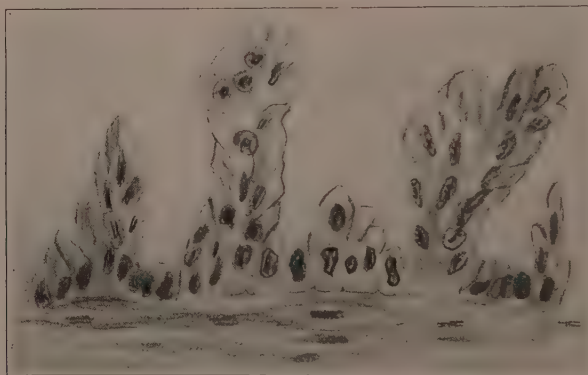
Fig. 159.—Section from wall of papillary cystadenoma of ovary.

a monstrous growth, showing development of all three of the embryonal layers; ectoderm, mesoderm, and entoderm. It represents, included within the tissues or attached to the body of one individual, extra tissues representing portions of another individual. The latter may be an included twin, or may be derived from a ripened unimpregnated ovum—parthenogenesis. The view that dermoids are derived from inclusions of integument during early embryonic life is now seldom advanced.

Embryomata appear at any age, usually after puberty. They are 4 per cent of ovarian tumors. They occur more frequently on the left side and are seldom bilateral.

PATHOLOGICAL ANATOMY

Embryomatous cysts are rounded in contour, are almost always unilocular, have a smooth capsule, and vary in size from that of a

pea to a man's head. The *contents* are a fatty broth-like fluid containing sebum, cholesterin, epithelium, and detritus. Usually there is an abundant growth of long *hair*, sometimes there are flat bones in the walls and sometimes malformed *teeth*. Usually there is a preponderance of tissue derived from the integument.

The external layer is flattened germinal epithelium of the ovary,
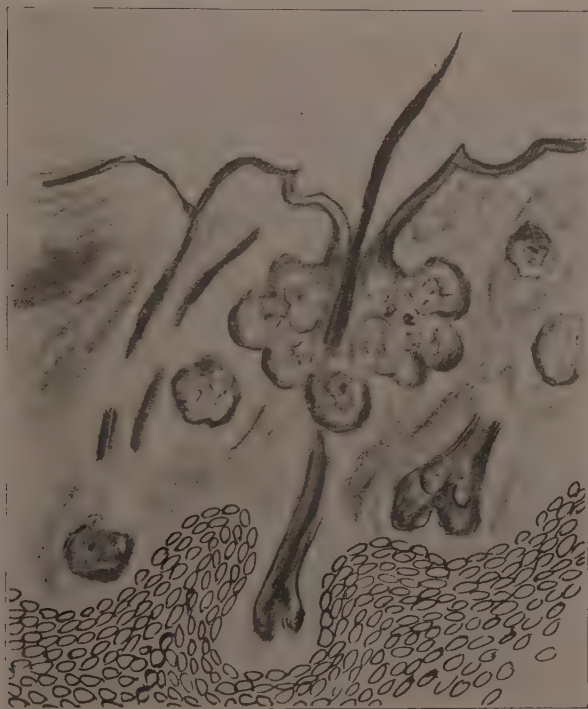
Fig. 160.—Section from wall of embryoma of ovary.

the middle layer of the cyst wall is connective tissue resembling the fibrous layer of the skin, and the inner lining is formed of layers of squamous epithelium such as is found in the epidermis. Sweat and sebaceous glands are frequent. Hair follicles, usually bearing long blonde hairs, occur abundantly, growing chiefly from a small knob of thickened skin situated somewhere on the inner surface of the cyst wall.

The connective tissue and muscular elements of the skin are pres-

ent.   In addition, cartilage, cartilaginous bone, and membranous bone are sometimes observed.   Therefore the embryomata or dermoids are true teratomata, containing tissues derived from all of the embryonal layers, representing rudiments of another individual.

Almost any body tissue may be found in embryomata.   Portions of intestine, of brain, bundles of striated or smooth muscle fibers, pieces of cartilage—in short, any structure may be found except the primordial germ tubules of the ovary.

The difference between an embryoma and a solid teratoma is merely that the former partakes chiefly of the character of a sac composed
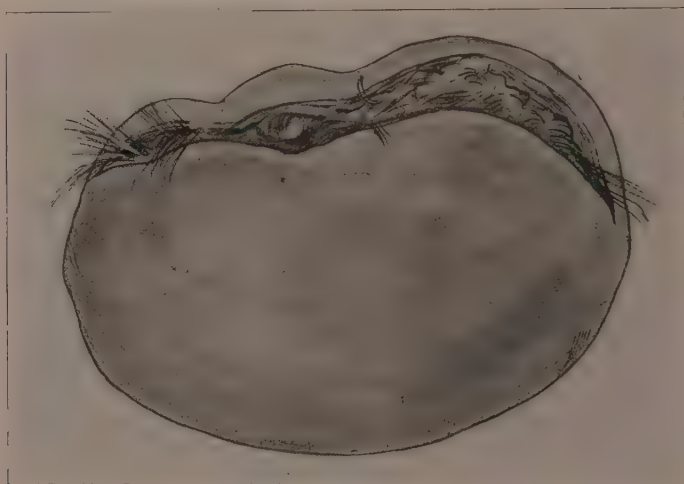
Fig. 161.—Embryoma of ovary.

of true skin, with the other tissues incidental, while a solid teratoma contains little skin or fluid, but is composed of cartilage, bone, muscle, intestine, or other tissues.   Some teratomata of the ovary are formed of tissue like that of the thyroid gland; such are called struma ovarii.

Retention Cysts of the Follicles

Follicular cysts of the ovary are extremely common, although they seldom reach the size of large tumors.   They occur at any age, from early infancy to senility.   The cysts are seldom single but usually are very numerous although of small size.   One cyst may reach the size of an egg or small orange.   This may be because of excessive

growth of one dilated follicle or because of coalescence of several cystic follicles.

Etiology

In the preexisting space of a follicle escape of fluid is hindered, more is continually produced, and a cyst results. A follicle ripens to a certain degree and then the ovum may die. The cells of the granulosa and of the theca may degenerate and disappear, whereupon the cavity of the follicle fills with serum. More serum is
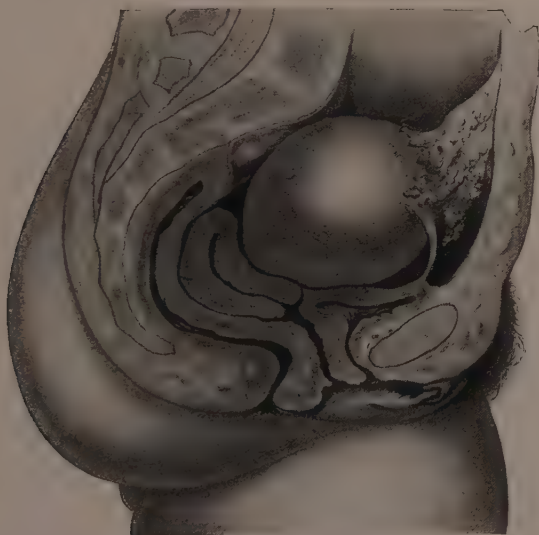
Fig. 162.—Dermoid cyst filling pelvis and displacing uterus backward. (Montgomery—*Practical Gynecology.*)

exuded and the cyst grows. This process may occur in follicles of every grade of development, from the primordial follicle to the fully ripened one. Normally the latter may be prevented from bursting because of thickness of the tunica albuginea, resulting from chronic infection of the ovary.

The cause of death of the ovum in these cases is usually some *chronic congestion* resulting from infection or pelvic adhesions, or some irritating toxin in the blood. Acute infectious diseases, such as measles, variola, and scarlatina, in early childhood are often followed by the death of many primordial ova and cystic enlargement of the affected follicles.

Small cystic degeneration of the ovary is commonly the result of chronic infection of the pelvic organs and consequent chronic oophoritis or chronic congestion of the ovary. It may be that, under the influence of the hyperemia, an increased number of follicles ripen, their ova die, and the follicles become cystic. Sometimes the whole ovary is a mass of small cysts with very little true ovarian tissue in evidence.

In more than half of the cases of *cystic mole* and of chorioepithelioma malignum the ovaries are cystic. During pregnancy many ova die within the follicles; the latter dilate with the serous cystic fluid. In some of these cases there is more or less yellow color to
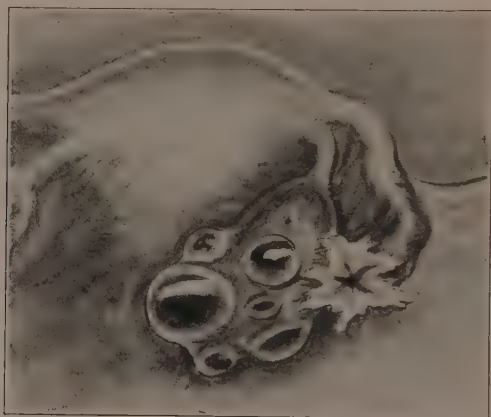
Fig. 163.—Cystic ovary prolapsed into rectouterine pouch.

the contents of the cysts because of lutein formed by the cells of the theca, which do not entirely lose their functions.

PATHOLOGICAL ANATOMY

Follicular cysts of the ovary usually appear as multiple rounded nodules showing on the surface and in the cut section. They contain a serous fluid, usually clear and aseptic. The affected ovary is enlarged to a moderate extent. Often there is little real ovarian tissue remaining, except in the stroma in the region of the hilum. Both ovaries are often cystic. Occasionally there will be only one rather large cyst. This form is sometimes classified as *simple cyst*

of the ovary. Commonly there are other small cysts scattered throughout the parenchyma.

Pathological Histology

The cysts are simply cavities in the ovarian tissue and can not be said to possess a capsule distinct from the connective tissue of the organ. Sometimes remains of the epithelioid cells of the theca can be distinguished in the follicular cysts proper, but often the innermost layer is composed only of somewhat flattened connective tissue cells. The fluid contents are usually derived from the blood vessels by transudation.

Corpus Luteum Cysts

Cysts of the corpora lutea are single cavities due to dilatation. They contain yellow fluid. The walls are lined by the theca cells
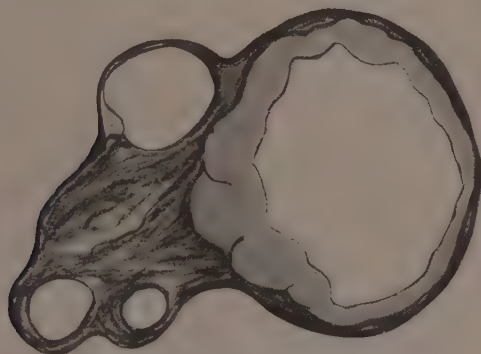
Fig. 164.—Corpus luteum cyst.

which secrete lutein. The cystic dilatation of the cavity of the corpus luteum is due to the same chronic congestion and consequent transudation of serum from the blood vessels of the ovary into the cavity which obtains in the case of ordinary follicular cysts.

In cysts of the corpus luteum much of the inner thecal layer composed of the lutein cells remains. The cysts are larger than simple follicles and contain a fluid distinctly yellow.

Tuboovarian Cysts

On account of adhesions between tube and ovary, a cyst of the latter may come into close contact with the tube; the intervening

wall between the two cavities may partially disappear, and there-
fore the two communicate. If the openings of the tube are still per-
vious, it is possible for the contents of the cyst to drain into the peri-
toneum through the abdominal ostium, or into the uterus through
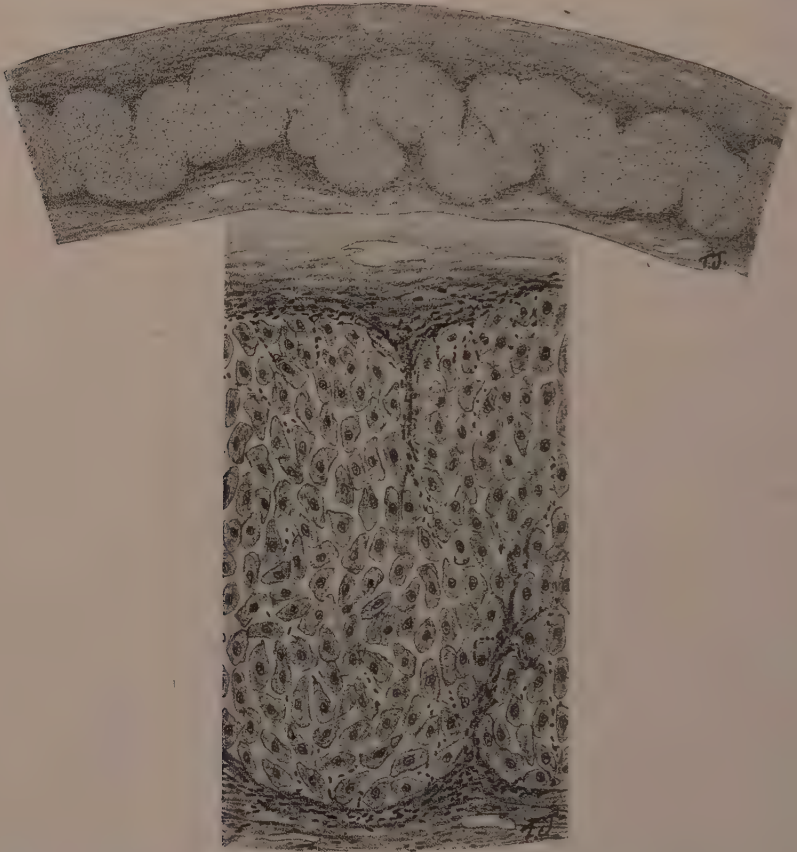
Fig. 165.—Layer of lutein cells. The upper part of the drawing shows the corrugated
yellow layer, while the lower portion represents a high magnification, showing the individual
lutein cells. (Crossen—*Diseases of Women.*)

the uterine opening. Usually, however, previous infection has closed
both of these ostia.

On the other hand, a tube distended by fluid or pus may become
adherent to an ovary near a graafian follicle or corpus luteum,
and may communicate with the cavity in the ovary. In these ways

are formed tuboovarian cysts and tuboovarian abscesses. Both occur frequently.

Parovarian Cysts

ETIOLOGY

Between the layers of the broad ligament at its outer portion, lies a rudimentary organ, the *parovarium or epoophoron*. The small tubules comprising the organ lie in that part of the broad ligament
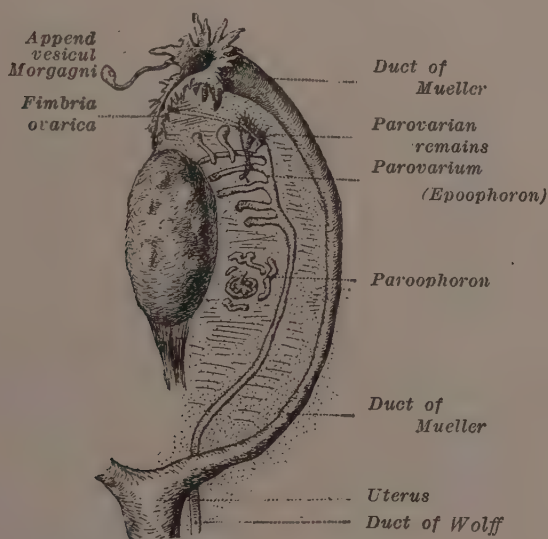
Fig. 166.—Embryonic genital organs, showing the parovarium and paroophoron, and their relation to the tube and ovary and duct of Gärtner. (Abel, after Kollmann—*Gynecological Pathology*.)

which is sometimes called the mesosalpinx. The parovarian consists of a group of tubules or columns of cells running from the remains of the wolffian duct towards the hilum of the ovary.

These columns and tubules represent the sexual portion of the wolffian body, the long tube the wolffian duct. These tubes and columns are composed of two layers of muscle and fibrous tissue and the lumen of each is lined with ciliated epithelium, cuboidal, and cylindrical. The tubes all end blindly.

Because of hypersecretion of the epithelial cells, some of the

tubes may distend into cysts. Such cysts are not infrequent. They are seen in about 10 per cent of all operations for ovarian tumors.

Pathological Anatomy

They are unilocular and vary in size from that of a pea to a man's head, or larger. They may originate in any portion of the upper part of the broad ligament, between whose folds they grow, extending upwards and outwards to fill the pelvis, or into the general
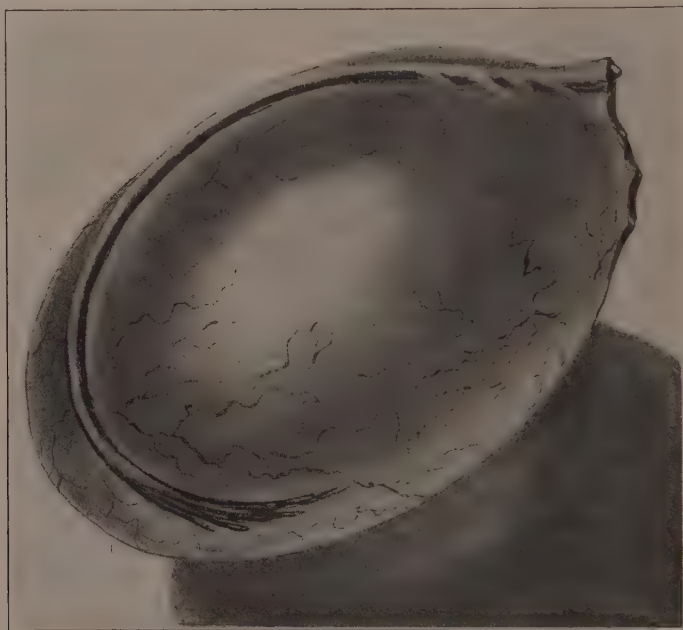
Fig. 167.—Parovarian cyst. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

abdominal cavity. On the posterior aspect one sees a nearly perfect circle made up of the tube, the fimbria ovarica, the ovary and its ligament, all stretched over the surface of the cyst.

The cyst is usually *pedunculated*. The rather broad pedicle is formed by the mesosalpinx, the tube, the ligamentum ovarii proprium, and the suspensory ligament of the ovary. The broad ligament is stretched out to form the outer covering of the cyst.

The wall of the cyst is smooth or only slightly folded. It has the

glistening appearance of peritoneum with which it is covered. The contents are a thin clear fluid which contains little or no albumin and is of low specific gravity. It contains little else than water, salts, a very little pseudomucin, and sometimes some urea or albumin. Occasionally there are cholesterin crystals.
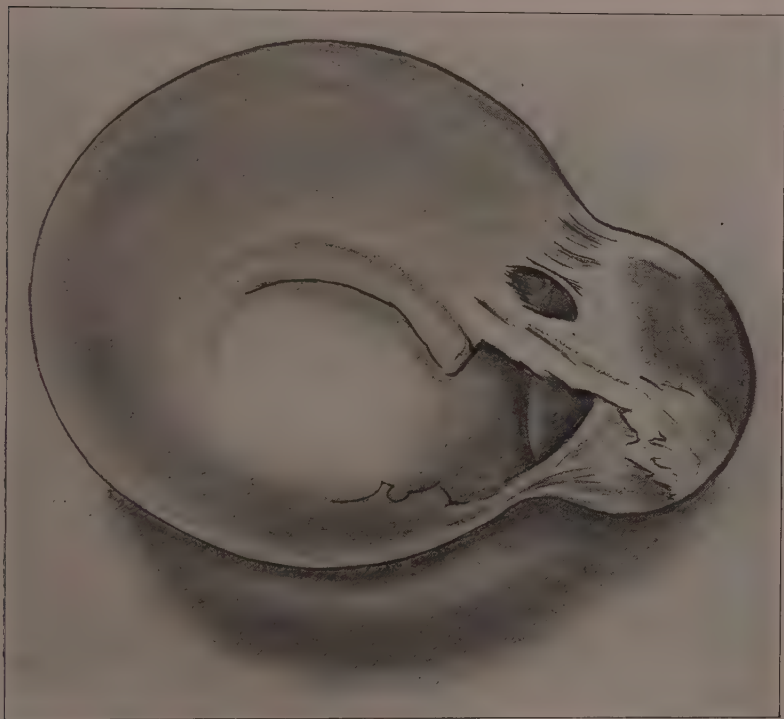
Fig. 168.—Parovarian cyst. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

PATHOLOGICAL HISTOLOGY

The wall is composed of three layers; the outer, derived from the layers of the broad ligament; the middle, composed of fibrous connective tissue poor in nucleated cells and a little unstriated muscle; and the inner, composed of epithelial cells of cuboidal and columnar type bearing cilia. These cells probably secrete the fluid contents of the cyst. The cells rarely undergo rapid proliferation.

Mitotic figures are seldom seen, giant cells never. There is no tendency towards malignancy.

Torsion of the Pedicle

The pedicle of an ovarian cyst is composed of the mesovarium, the ovarian ligament proper, and the ovarian fold of the infundibulo-pelvic ligament. When the cyst or ovarian tumor is large, the broad ligament is drawn into the pedicle with the whole of the infundibulo-pelvic band. As an ovarian tumor enlarges and extends upwards out of the true pelvis into the general abdomen, the tube is lengthened by stretching and runs across the tumor like a ribbon. The uterus is often drawn out of position by the pull of large tumors.

Torsion of the pedicle is always present to a certain degree, because the growing ovarian tumor falls into the cul-de-sac of Douglas and necessarily rotates the lengthening pedicle as it turns into that fossa.

Sometimes the ovarian cyst extends *between the folds of the broad ligament* and thus becomes covered by a peritoneal coat. Sometimes adhesions form between the tumor and the posterior side of the broad ligament, causing the tumor to have an anterior peritoneal coat. In both instances, the pedicle is broad if the ovarian tumor is small, but is drawn out into a narrow band as the ovarian tumor enlarges and extends upwards.

Torsion of the pedicle of sufficient moment to cause pathological changes occurs mainly in *tumors of moderate size*. The small tumors and those which fill the abdominal cavity are seldom sufficiently mobile to permit torsion.

ETIOLOGY

The first start in the torsion is due to the fact mentioned above, that the tumor falls into the cul-de-sac, but is held at one pole by the attachment of the pedicle, like a ball on a string. Further twisting is caused by motions of the body, the movements of the intestines, changes in the posture of the body, falls, and muscular exertion. In young children ovarian tumors are more prone to twist than in adults, probably because of the more active and violent motions of the child.

Every impulse acting to move the tumor tends to turn it in the *direction* in which it started to twist. The shape of the pelvic cavity and of the false pelvis favors twisting in the same direction. Tumors arising from the left side of the pelvis rotate towards the right, those arising from the right side rotate towards the left. In other words there is a tendency to twist towards the center.
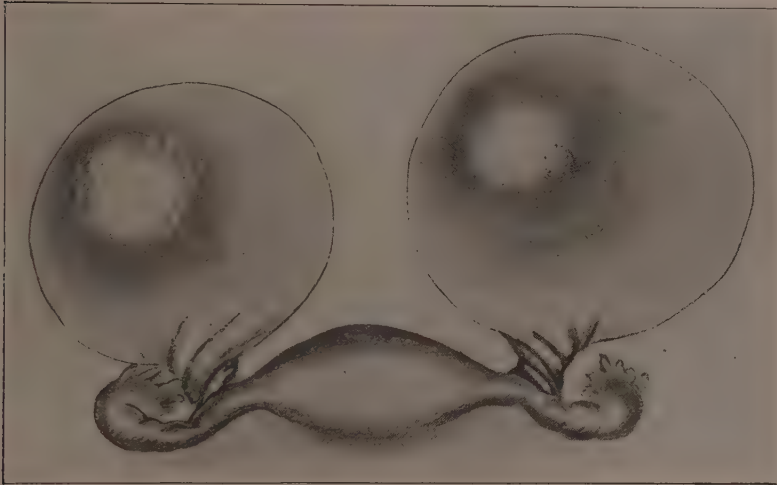
Fig. 169.—Torsion of pedicle in bilateral ovarian cysts.

Results

The more rapidly the torsion occurs, the more marked are the pathological results. These results are dependent upon interference with the blood supply *via* the twisting pedicle. With very gradual torsion there may be little or no bad consequences.

Acute torsion results in rapid shutting off of the blood supply by occlusion of vessels. Consequently the veins are first compressed and venous stasis in the tumor ensues. Edema rapidly supervenes, then extravasation of serum and blood with hemorrhages into the wall of the tumor and into the contents of a cyst. Soon the arterial supply is shut off and necrosis results.

Great *pain,* referred to the affected side of the abdomen or pelvis, *shock,* rising fever, increasing leucocytosis, rapid and weakening pulse, and similar symptoms are set up. *Infection* is certain to fol-

low quickly. The nearness of the intestines filled with bacteria is the usual reason. The serum and blood extravasated into the peritoneum, as well as the fibrinous exudate so quickly covering the surface of the tumor, serve as excellent culture media. Many varieties of microbes are found in different tumors, and even in the same tumor. The most common are colon bacilli, septic streptococci, and putrefactive organisms.

Chronic torsion results in less severe lesions and less severe symptoms. At first the stasis causes edema of the tumor. Soon adhesions form between it and the surrounding peritoneal surfaces. The tumor increases in size because of the serum and blood within it. Its surface becomes cloudy and roughened; the color blue or purple. Gradually increasing distress in the abdomen, general malaise, intestinal and digestive disturbances, interference with the functions of rectum and bladder are among the symptoms noted. Obstruction of the intestine may result either slowly or suddenly by reason of the adhesions between them and the tumor, as torsion goes on.

Rupture of cysts with twisted pedicles, especially those which twist rather quickly, is not uncommon.

Clinical Manifestations in Ovarian and Parovarian Cysts

The **rate of growth** of ovarian and parovarian cysts varies according to their variety. Follicular, dermoid and intraligamentary cysts are of slow growth. Cystadenomata grow more rapidly. Rapid increase in the rate of growth of any ovarian tumor is an indication of malignant metamorphosis.

Spontaneous cure of these cysts is very rare. It takes place by absorption of the contents or by rupture of the cyst and atrophy of its walls. In general, the tendency is towards death; gradually by exhaustion, great loss of albumin, disturbed circulation, respiratory disorders, or more rapidly through complications, such as torsion of the pedicle, rupture, hemorrhage, suppuration, and malignant degeneration.

The **menstrual symptoms** are variable. Often the periods are entirely normal. Less often they are profuse and of long duration. Amenorrhea is rarely observed. It only occurs when the glandular tissue of both ovaries is completely destroyed.

The **bladder** and the **intestines** are often affected by the presence of the cysts. Small tumors may draw the uterus forward, compressing the urethra or neck of the bladder and causing painful urination. Larger tumors may interfere with the filling of the bladder, and so give rise to frequent micturition. In most cases, however, the bladder accommodates itself to the presence of even large cysts of the pelvis and lower abdomen, as it usually does in pregnancy. The ureter is seldom compressed.

Small pelvic cysts may press upon the rectum and interfere with defecation. This is especially likely in the case of an intraligamentary cyst or of one situated retroperitoneally. The main influence of cysts upon the intestine is through adhesions. The caliber of the gut may be reduced, or the intestine may be drawn out of place. Peristalsis may be impeded and even obstruction may result.

Pain is not a regular symptom of ovarian cysts. It is usually secondary to pressure or to adhesions. In acute torsion of the pedicle the pain may be severe and sudden. The abdomen will usually increase rapidly in size from the swelling of the cyst and from the exudation of fluid into the peritoneum and from gaseous distention of the bowels. Accompanying these symptoms may be fever, marked tenderness on pressure, vomiting, and hiccough.

Rupture of the cyst may cause no symptoms. Sometimes slight fainting sensations may result, but it is only when the cyst has pathological contents which cause peritonitis or when hemorrhage occurs in consequence of the rupture that severe symptoms occur.

Hemorrhage into the cyst or into the free abdominal cavity may result from torsion of the pedicle or from rupture. The signs of internal hemorrhage will then be in evidence.

Suppuration within the cavity may result in no symptoms of importance unless the pus escapes into the peritoneal cavity and causes peritonitis. As a rule, however, there will be pain, tenderness, fever, and straining.

Cachexia is now rarely observed in cases of ovarian cyst unless malignancy has supervened. In olden times the *facies ovarica* was the term used to describe the pinching and drawing of the countenance as a result of the presence of the enormous cysts which were observed in those days.

DIAGNOSIS

The process of making a diagnosis is different in large and in small cysts.

The **smaller cysts** lie towards one side of the pelvis or extend into the abdominal cavity from one side. The pedicle can usually be distinguished by palpation or by vaginal examination. The tumor can generally be isolated from the uterus bimanually. Fluctuation is often distinct.

When the ovarian cyst unites with the tube so as to form the *tuboovarian cyst* the resulting tumor is rather elongated and sausage-shaped. Cyst of the tube can be differentiated from that of the ovary by feeling the ovary in its normal situation on rectal examination.

Exudation in the parametrium is distinguished by its more diffuse situation, its greater density, and its immobility. The history of previous infection will usually aid in the diagnosis.

Retroflexion of the gravid uterus may appear like an ovarian cyst located in the middle of the cul-de-sac of Douglas. It is to be distinguished by absence of the uterine body anteriorly and by feeling the ovary in its normal location on bimanual or rectal examination. A history of pregnancy and the other points in its diagnosis will help to clear up the case.

Uterine myoma of the pedunculated subserous type may often resemble ovarian cyst. It is distinguished by greater density, nodular character, close attachment to the uterus, and finally by the discovery of the ovaries in their normal situations.

The **larger cysts,** which lie in the median line and fill up a great part of the abdomen, exhibit other points of difference. *Fluctuation* is here a weighty point. It must be differentiated from the deceptive wave which runs across a fat abdominal wall. Differentiation is made by cutting off the latter wave by the edge of an assistant's hand placed in the middle line.

Percussion reveals dullness extending upwards from the pubes along the median line, while the epigastrium and flanks are tympanitic. This area of dullness is little changed by change of posture. Except in the largest tumors, the uterus can usually be isolated from the tumor on *bimanual* examination.

A soft or *cystic myoma* of the uterus sometimes presents

much difficulty in differentiation from a large ovarian cyst. The diagnosis may be made by finding the pedicle of the cyst or by identifying the uterus or ovary in its normal place. Sometimes other nodules of fibromyomata may be felt in other parts of the generally enlarged uterus. Fluctuation is rarely as distinct in uterine as in ovarian cystic growths.

Pregnancy, especially with hydramnios, is often mistaken for ovarian cyst and vice versa. Palpation of the fetal parts, hearing of fetal heart tones, noticing fetal movements, ballottement, etc., will speak for pregnancy. Distinct fluctuation, presence of a pedicle, identification of the normal uterus below the tumor, the different rate of growth, and absence of a history of pregnancy will point towards ovarian cyst. In cases of multilocular cystadenoma, the consistency of the different portions of the tumor may differ so widely that one gets the impression of the presence of fetal parts. The Abderhalden test may be of use and the x-ray may show the fetal skeleton.

Ectopic pregnancy may be mistaken for small pelvic ovarian cyst. In it, however, there will be no fluctuation, but a boggy feeling. The pregnant tube is usually not freely movable, but lies close to the uterus without a marked pedicle.

Ovarian cysts sometimes must be differentiated from soft *tumors of other organs,* notably the liver, spleen, kidney, and omentum. The evident growth from the pelvis and connection therewith will be important diagnostic points.

The diagnosis is more difficult when there are many *adhesions.* When the tumor is small, it may be so closely attached to other organs, especially the uterus, that it can not be distinguished from exudate, the sacculated tube, or a pyosalpinx. Adhesions of intestine and of omental masses to the cyst will, in many instances, change its appearance so as to obscure the diagnosis.

The *diagnosis of the different varieties* of ovarian and parovarian cysts is not always easy. Simple follicular cysts are usually of one chamber. Cystic degeneration of the ovary seldom causes much enlargement, and gives the feeling of nodules. The dermoids have only a moderate size, have little or no fluctuation, and often have a doughy feeling. Sometimes one can feel the bony plates in the walls. Large multilocular cysts are almost always cystadenomata. They

grow faster than the others. It is seldom possible to differentiate between the pseudomucinous and the serous cystadenomata before operation.

PROGNOSIS

The prognosis in cysts of the ovary and parovarium is not favorable. While they do not of themselves destroy life, yet they are subject to complications and malignant degenerations enough to give them something of a grave import. They tend to increase in size, to encroach upon other organs, to distress the patient, and to make life miserable for her. They have almost no chance of spontaneous recovery.

TREATMENT

Almost all authorities unite in recommending *removal* when the diagnosis has been made. Schauta says, ''Every cyst of the ovary, as soon as it can be diagnosticated, must be removed.'' No other treatment is anything else than palliative. The longer operation is delayed, the larger will the cyst grow, and the more likely are complications to occur. Nothing is gained by waiting beyond the time necessary to prepare the patient. An early operation is a safe operation—a late operation may be dangerous and futile.

These remarks do not apply to ordinary uncomplicated cases of cystic ovary. These, as a rule, do not require operation.

CYSTS OF THE TUBES

Pathology.—The common variety of cyst of the tube is a *retention cyst*, caused by inflammatory closure of the abdominal and uterine openings and accumulation of fluid within the distending cavity. Some of these cases of sactosalpinx or hydrosalpinx result from a previous pyosalpinx whose purulent contents have been absorbed and replaced by a seromucous fluid derived from exudate out of the vessels and secretion from the cells of the mucous membrane.

The cystic tube has an irregular sausage-like form and seldom reaches a very large size. The walls are thinned from distention. Much of the epithelium of the mucous membrane becomes denuded as time passes. The contents become less mucous and more serous.

Clinical Course.—Symptoms are often absent unless there are troublesome adhesions which distort the tube and other pelvic organs

and interfere with their circulation. In such cases the uterus will often be somewhat enlarged, will secrete a copious mucous discharge, and will bleed excessively at the menstrual periods. Dysmenorrhea may be present.

Such cystic tubes are usually the remote results of pelvic infection. Therefore they are usually accompanied by cystic degeneration
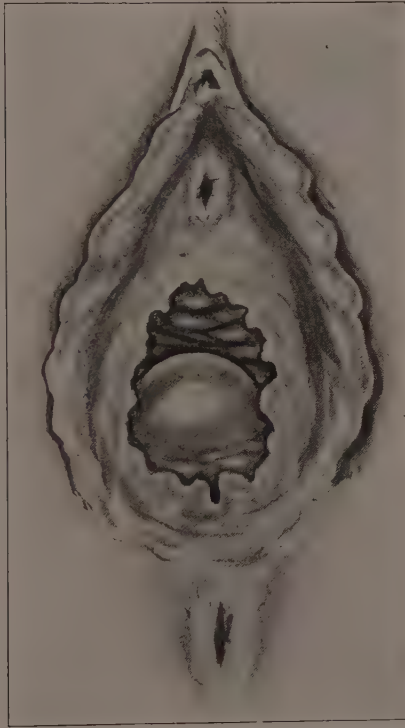
Fig. 170.—Cyst of posterior vaginal wall.

of one or both ovaries. Adhesions are also results of the original infection.

Treatment.—Most cases which show symptoms can be benefited by *palliative* treatment such as glycerine tampons, hot douches, colonic flushings and other measures which would be indicated in cases of chronic infections of the pelvis.

Occasionally the tumor causes enough disturbance to justify opera-

tion. The abdomen is opened and adhesions are broken up. The offending tube is removed, and resection of the cystic portions of the
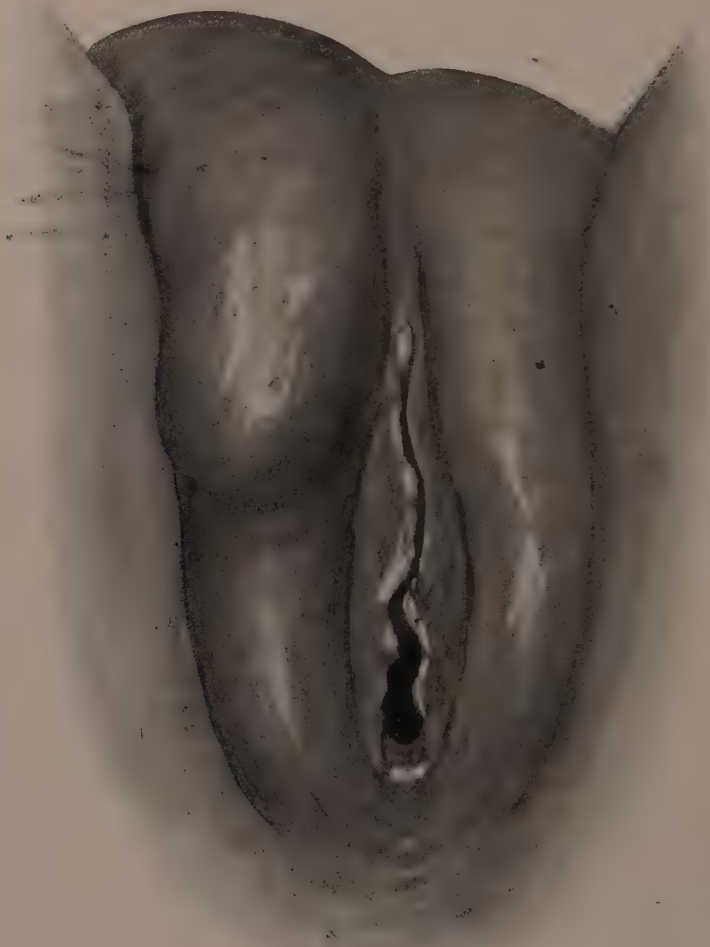
Fig. 171.—Inguinolabial hernia.

ovaries is done. The uterus is frequently retroverted or retroflexed and held backwards by adhesions. After separating these, the uterus should be brought forward and anchored by some one of the operations for shortening of the round ligament.

CYSTS OF THE UTERUS

Cysts of the uterus are almost always due to cystic degeneration of *myomata* or to proliferation of *misplaced wolffian tubules* in the posterior uterine wall or in a myoma. In either case the diagnostic points are similar to those of uterine myomata and the treatment is the same.

CYSTS OF THE VULVA AND VAGINA

Developmental cysts of the posterior wall of the vagina are practically the only cystic tumors of that organ observed. They arise from wolffian remains which proliferate and grow extensively. The thin-walled fluctuating cystic tumor projects into the vagina from the posterior wall, distending the mucous membrane. It may reach the size of a fetal head.

They are distinguished from *rectal tumors* by rectal examination and from *hernia* by the evident presence of fluid without gaseous contents.

The *treatment* consists in dissection and removal.

Developmental cysts of this type sometimes appear in the *vulva* as small tense swellings in the sulci between the labia majora and labia minora.

Cysts of the Vulvovaginal gland (Bartholin cysts).—Infection of these glands most often causes closure of the openings and consequent retention cyst formation. Rarely they may result from injury. Mucus is secreted and distends the lumen of the gland.

There is usually a history of a former painful disorder in the region of the gland, frequently the formation of an abscess. The cystic tumefaction shows under the mucous membrane of the vulva in the situation of the gland, and causes that part of the vulva to bulge. Palpation reveals the fluctuating tense rounded tumor formed by the distended gland. The size of the tumor is seldom more than that of a walnut.

It must be differentiated from acute infections and tumors of the vulvovaginal gland and from inguinolabial hernia.

Treatment consists in dissection, removal of the cyst, and suture of the wound.

CHAPTER XVII

ECTOPIC GESTATION

Ectopic gestation or extrauterine pregnancy, means the attachment, embedding and development of the impregnated ovum in some place other than the normal one, that is, somewhere outside of the uterus.

Depending upon the location of the ectopic ovum, extrauterine pregnancy may be tubal, tuboovarian, ovarian, or abdominal. Re-
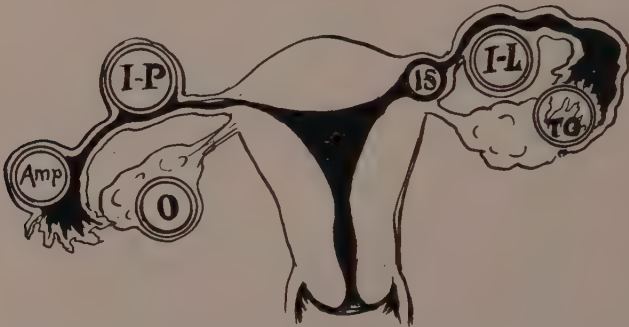
Fig. 172.—Diagram showing sites of ectopic gestation. *Amp,* ampullar pregnancy; *I-P,* isthmic, rupturing into peritoneum; *O,* ovarian; *IS,* interstitial; *I-L,* isthmic, rupturing into the broad ligament; *TO,* tuboovarian.

lated conditions are pregnancy in a rudimentary horn, or in one horn of a bicornate uterus. Pregnancy may begin within the tube and, by extrusion of the ovum, become secondarily located elsewhere, especially in the abdominal cavity. A pregnant tube may rupture into the space between the folds of the broad ligament, giving rise to intraligamentary pregnancy.

The ovum may become embedded in the mucous membrane of one of the tubal fimbriæ, especially the ovarian fimbria. In ovarian pregnancy the ovum embeds itself within the ruptured graafian follicle, and develops in the wall of the resulting corpus luteum. Tuboovarian pregnancy, like tuboovarian abscess, develops in the tube

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and extends to the ovary because of adhesions between the two organs.

ETIOLOGY

Ectopic pregnancy is *almost always tubal;* the other varieties are curiosities. The cause of embedding in the abnormal location is something which delays the normal progress of the impregnated ovum through the tube, thus permitting the ovum to attain to an abnormal size before reaching the uterine cavity. The obstructing element may be inherent in the ovum or be due to abnormality of the tube.

The **cause in the ovum** may be too rapid growth, external wandering in the abdominal cavity before entering the tube, or twin ovum. Some ova have a tendency to excessive development, perhaps due to a superabundance of germinal material within them. Such is the reason why twins are so much commoner in tubal than in uterine pregnancies. If an ovum wanders from the ovary of one side to the ostium of the tube of the other side, it is likely to be overgrown. It is undisputed that the ovum imbibes nutriment from the cells of the discus proligerus which accompany it and from the juices of the peritoneal cavity as it passes.

The **cause in the tube** is probably the more frequent. Previous disease of the mucosa is very commonly an item in the history. The disease will usually have been mild. Severe salpingitis, for example, would so damage a tube that it would be permanently occluded, so that entrance of an ovum would be impossible. It is possible in the course of years, for even a marked salpingitis to so far recover as to allow entrance of an ovum, but the mucosa may have been so much damaged that the growing egg will be stopped in its passage. Sometimes this will be because the ovum lodges in some pocket between adherent folds or finds the passage between folds too narrow. Doubtless the corrosive action of the trophoblastic layers of the ectoderm of the impregnated ovum becomes enhanced with time, and therefore, as time goes on and the passage becomes delayed, the adhesion and embedding of the ovum in the mucous membrane of the tube becomes established.

Besides the results of chronic endosalpingitis, other factors may render the tube a poor transmitter of the ovum. Such are adhesions of the tube to neighboring organs, accessory tubal canals, disturbances

in tubal peristalsis, abnormal length or shape of the tube, or pressure from tumors or enlarged organs. The causes of ectopic pregnancy are numerous, and doubtless many of them are still unknown. The future may discover some ultimate cause which will overshadow those already enumerated.

PATHOLOGY

Tubal pregnancy is *classified* according to the part of the tube in which the embedding of the ovum occurs. Therefore we distinguish ampullar pregnancy, isthmic pregnancy, and interstitial pregnancy. The general principles of pathology are similar in all, but the results are somewhat different on account of the anatomical peculiarities of the different regions of the tube. More than three-fourths of tubal pregnancies occur in the ampulla, a few in the isthmus, and a very small proportion in the interstitial portion.

The *ovum embeds itself in the tube* much as it does in the endometrium. In the latter, however, the ovum finds a well developed mucous membrane with epithelial and connective tissue portions and a system of glands, all ready for the production of a distinct and well marked decidua. The chorionic structures seldom reach as far as the muscular layer.

In the tube there is a most *rudimentary decidua* formation, the tubal mucosa contains only a surface epithelium with very small amount of connective tissue and there are no glands as in the uterus. Therefore the embedding ovum soon sinks below the mucous membrane, reaches the tissue at the base of the folds, and soon extends into the muscular coat. The irritation, with its resulting hyperemia, causes hyperplasia of the connective tissue and of the musculature. In the midst of this hyperplastic connective tissue and muscle the embedded ovum lies, usually entirely outside of the epithelial layer of the tube and outside of the tubal lumen.

The ovum, besides its own amniotic and chorionic layers, is covered, not by a true decidua, but by muscle and connective tissue cells, leucocytes, and, on the side towards the lumen, epithelium. Erosion of the trophoblasts into blood vessels causes always more or less hemorrhage, so that there is always considerable blood within the tissues near and around the ovum.

Tubal Abortion

In **ampullar pregnancy** the ovum has a greater chance to grow and distend the walls of the tube, which are in this situation elastic. This portion of the tube has a loose mesentery, and therefore is capable of free movement. Often the fimbriated extremity is not completely closed. The ovum is easily separated from its attachments, and hemorrhages are thus permitted between the ovum and the tubal walls. Contractions of the muscular fibers of the tube are set up which increase the separation and gradually force the ovum back through the tubal lumen and towards the abdominal ostium.

Bleeding takes place from eroded maternal vessels into the spaces around the ovum and into the lumen and thence out through the ostium into the peritoneal cavity. Thence the blood gravitates into the cul-de-sac, where it may be palpable as a hematoma through the vault of the vagina. Rarely some blood may trickle through the isthmus and interstitial portion of the tube into the uterine cavity and thence through the vaginal opening. Such bleeding is seldom copious.

Sometimes the loosened ovum is forced out into the peritoneal cavity; more often only partially and showing through the ostium. Often the ovum will die before completely separated from the tube wall and will undergo alterations as a *tubal mole*. This is doubtless a common termination of a tubal gestation, whose diagnosis is therefore never corroborated or perhaps not even suspected.

Tubal Rupture

In **isthmic pregnancy** the ovum seldom attains such a degree of development as it does in the ampulla. The walls of the tube are here more dense and less distensible, the caliber of the lumen is more minute, and the tube is held rather snugly close to the upper margin of the broad ligament so that it has small opportunity of motion.

The trophoblastic peripheral cells of the impregnated ovum eat into the connective and muscular tissues of the wall and are likely soon to penetrate to the peritoneal surface. Meanwhile the growth of the ovum soon distends the narrow confines of the tube, and rupture is likely to result. When the tube wall ruptures, some fair sized vessels may be eroded or torn and consequently severe hemorrhage into the peritoneal cavity is the result. Sometimes the partially de-

tached ovum is forced into the rent and plugs it. In such an event the phenomena are more likely to resemble those of tubal abortion. This process may be repeated several times.

It must be emphasized that rupture occurs not because of distention of the tube by the growing ovum and the exudation which accompanies it but because of the erosive action of the trophoblastic cells of the primordial chorion. Similarly tubal abortion takes place not because of contractions of the muscle but because of hemorrhages between ovum and tubal tissues, caused by this same erosion into the maternal blood vessels.

Considering the average run of cases of ectopic gestation, rupture occurs in about 40 per cent, and abortion in about 60 per cent. Of the cases which come under notice *in extremis* 83 per cent are cases of rupture, and 17 per cent of tubal abortion.

Rupture of the tube may occur, not out into the free peritoneal cavity, but between the layers of the broad ligament. The hematoma formed by the clotted blood from the maternal vessels may distend the tissues of the broad ligament and the parametrium so as to form a tumor of considerable size in that locality.

In **interstitial pregnancy** the ovum becomes embedded in that portion of the tube which runs through the wall of the uterus. Here the uterine muscular structure usually prevents rupture, but the ovum, as it grows, is likely to be forced either towards the uterine cavity or back into the isthmus of the tube. In some cases the lumen may be closed at either end and the ovum may grow surrounded by uterine muscular tissue. Death of the ovum is the common result, with rupture of the sac into the uterine cavity, into the parametrium, or into the abdomen, or gradual encapsulation.

Tubal abortion is not necessarily confined to cases where the embedding was in the ampullar portion of the tube, nor tubal rupture where embedding was in the isthmus. For the reasons named, tubal gestation located in the isthmus more often ruptures, and that located in the ampulla more often aborts.

Secondary Ectopic Gestation

Secondary ectopic pregnancy usually is a result of tubal rupture at an early stage, while the trophoblasts are still at the height of their activity, and secondary attachment of the ovum to some other organ or peritoneal surface. The ovum may then continue to de-

velop, surrounded by adherent peritoneal folds, intestines, omentum, and mesentery.

Another possible method of formation of secondary pregnancy is by rupture of the chorion and amnion as well as the maternal coverings of the ovum, at a stage when the placenta and cord are well developed. The embryo is nourished by the placental tissue attached to the tubal wall, but grows free in the abdominal cavity, where it becomes provided with envelops composed of adherent peritoneal organs and structures.

RESULTS

The immediate results of ectopic gestation have already been described. *The remote results* are less common and less striking. When the immediate results reveal the diagnosis of extrauterine pregnancy, operation is almost always undertaken and the ectopic products of gestation are removed with the affected portions of tube, ovary, or other organ. Therefore remote consequences in such cases are those connected with the operation.

Tubal mole often results when the ovum dies at an early period in consequence of incomplete abortion or otherwise. The embryo is absorbed as is the amniotic fluid and the exudated serum. The chorionic villi undergo fatty and hyaline degeneration and are gradually absorbed. The clotted blood of the hematoma becomes organized by invasion of granulation tissue.

Mummification sometimes results in cases where the ovum dies at a late stage, when the fetus is well developed, or even when bones have begun to form. All the water in the tissues of the ovum and gestation sac becomes absorbed. Placenta, membranes, and fetus become wrinkled, flattened, and compressed into a mass near the uterus, often resembling a cyst of the ovary or a pedunculated fibromyoma.

Infection of the contents of the gestation sac is very likely to occur after the death of the ovum. The close contact of the mass with the rectum and sigmoid gives opportunity for migration of microbes within the intestinal tract into the excellent culture media furnished by the necrotic materials. Colon bacilli and septic cocci are the common infecting agents. Suppuration of the ectopic sac results with softening of the products of conception.

Sometimes the abscess points in the vaginal vault, is incised, and drained, or the contents are evacuated, and the cavity packed. Sometimes the pus burrows or escapes through an ulceration into the rectum, bladder, vagina, or through the abdominal wall. When the last piece of fetal bone and other particle of necrotic material comes away, the abscesses and sinuses will heal. Usually the process must be hastened by surgical measures.

Lithopedion is the term applied to calcification of the fetus remaining after death of the ovum. Lime salts are deposited within the tissues and gradually replace the tissues of the fetus themselves. Such stony masses have remained for years, often without serious symptoms.

Full-term ectopic pregnancies are not common in a relative sense,

Fig. 173.—Tubal gestation. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

but development into the later months before catastrophe comes to the ovum is frequently reported. There have been less than two hundred reported cases of full-term ectopic pregnancy with living child. Most of the cases of far developed extrauterine pregnancy are secondary abdominal.

Cystic degeneration of the chorionic villi may occur in ectopic as in uterine pregnancy; indeed, is relatively more common. Several cases have been reported of chorioepithelioma malignum arising in the pregnant tube.

DIAGNOSIS

The diagnosis of ectopic pregnancy presents many difficulties at all stages, especially before accident has overtaken the ovum.

Ovum Intact

Before rupture or abortion has taken place the diagnosis is usually not made, chiefly because there are no symptoms marked enough to lead the patient to suspect that her pregnancy, even if she recognizes it, is in any manner abnormal. If symptoms appear which lead the patient to consult her physician, and she consents to a bimanual examination, the probability of the diagnosis is likely to occur to him.

Most pregnant women have been led, by former experience or from hearsay, to expect various uncomfortable or even painful conditions during pregnancy, and therefore are sometimes slow to seek professional advice. If all women would select their obstetrician or would go to an obstetrical dispensary as soon as they believe themselves pregnant, the diagnosis of extrauterine pregnancy, as well as of other departures from the normal, would often be revealed and proper precautions could be advised.

Symptoms which lead one to think of ectopic gestation are not distinctive, but many of them are suggestive. Cessation of the menses is, of course, the usual preliminary symptom, as of uterine pregnancy. In ectopic pregnancy, however, absence of all flow at the regular time is less the rule. Believing herself pregnant, the woman may complain of tenderness low in the abdomen and towards one side. There may also be frequent colicky pains in the same region, sometimes enhanced with defecation. Often the slight bleeding from the uterus, which is not uncommon at the menstrual period, may lead the patient to a consultation under the belief that she is having an abortion.

On **examination** by a skillful practitioner a correct diagnosis is probable. One should make it a rule to examine bimanually all women who present themselves during the early period of pregnancy. Supposing that the pregnancy has advanced to the sixth or eighth week, one would find a uterus only slightly enlarged, if at all, but would feel a rounded or oval semicystic tumor in the region of the tube on one side. This would be about as large as a pigeon's egg or up to the size of a hen's egg. Care must be exercised not to press so hard upon this swelling that it will be artificially ruptured. If necessary an anesthetic should be given.

The usual symptoms and signs of pregnancy will usually be present, such as mammary symptoms, blueness of the vulva and vagina, nausea and vomiting, frequent micturition, increased pulse rate, etc. The Abderhalden test is less often positive in ectopic than in normal

pregnancy. Some authors speak of the value of feeling an increased force of pulsation in the uterine artery of the affected side. Acetonuria is thought by many to be a frequent diagnostic mark. Leucocytosis is likely to be higher than in normal pregnancy.

Tubal Abortion

When the ectopic ovum aborts, there is usually some pain referred to the side of the pelvis, often of severe character. If on the right side, appendicitis will often come prominently into consideration. There is seldom so severe a pain as that of an acute appendicitis, there is no temperature, seldom vomiting in direct connection therewith, and no hyperleucocytosis.
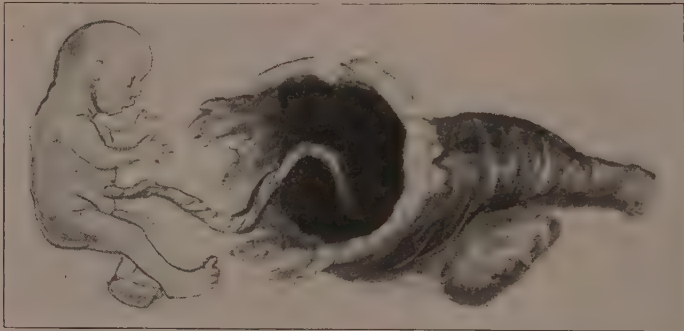
Fig. 174.—Tubal abortion. (From specimen in Obstetric and Gynecologic Museum, Loyola University School of Medicine.)

The pain is often of colicky type, often is recurrent, with intervals of several minutes or an hour of rest. Frequently the patient believes that she is having an abortion. External appearance of blood does not appear until later, and then seldom in large amount. The signs of shock depend for severity upon the amount of the internal hemorrhage. In some cases the depression and even collapse is as great as in tubal rupture but usually the signs of acute anemia are rather slow to appear and often do not appear at all.

It is not uncommon for the pains and signs of hemorrhage to decline and then appear again in a few hours or a few days. Sometimes these recurrences are in considerable number. Each time the patient gets paler and weaker, because each time there is a new hemorrhage as more and more of the aborting ovum separates from

the tubal wall. Finally, if allowed to go on, her state may become dangerous because of the continual small drain of blood.

The **hematocele,** that is, the collection of blood which gravitates into the pelvic cavity, is seldom recognized until after it has firmly clotted and after the serum has been separated from the fibrinous portion of the blood. Fluid blood in the cul-de-sac of Douglas can not be palpated. If in large amount, the blood may cause dullness and flatness on percussion in the flanks and above the pubes and this condition may change with change in position of the patient.

Tubal Rupture

The symptoms and signs of tubal rupture are usually more severe than those of abortion. On the other hand, the difference between the more severe cases of abortion and the less severe cases of rupture is so inconsiderable that a differential diagnosis between rupture and abortion can not be made in more than half of the cases. Fortunately the treatment is the same in both conditions.

The *typical severe case* of tubal rupture begins suddenly, in a woman who has probably missed one or two menstruations, by the onset of agonizing lancinating pain in the lower abdomen referred to one side. Often she will promptly fall in a faint from which she will only partly recover, still remaining profoundly shocked. The respirations will be fast, the pulse thready, weak, and rapid, the face pallid or slightly cyanotic. The pain and the first fainting is probably due to the rupture of the tube and the symptoms which follow to continuation of a considerable hemorrhage.

If untreated the woman may die in a few minutes or a few hours from loss of blood, or she may gradually rally after the bleeding ceases. The hemorrhage stops because of the falling arterial pressure which comes with hemorrhage, and from formation of clots in and around the bleeding vessels. If blood pressure does not return to normal too soon, bleeding may not begin again at once, especially if she is not disturbed.

Less than fifteen per cent of the cases of abortion or of rupture show the severe acute symptoms of the typical case above described. More than *eighty-five per cent are less severe,* be they abortion or rupture. In the case of any recently impregnated woman who suffers from irregular slight bleeding from the genitals, who has colicky pains referred to one side of the pelvis, who has frequent attacks of

more marked pain, followed by more or less signs of progressive anemia, one is justified in making a provisional diagnosis of ectopic gestation.

Thereupon, under aseptic precautions and with gloved hands, one should make a careful but very gentle bimanual examination, under ether if necessary. If he finds an enlarged tube or a soft tumor on one side of the vault of the vagina, he is justified in opening the abdomen for confirmation of his diagnosis and for therapy.

PROGNOSIS

Prognosis depends upon the severity of the case and upon the treatment. Any case of ectopic pregnancy at any stage of gestation, with or without symptoms, is a very present danger to the woman.

If no symptoms of abortion or rupture have yet shown themselves, the chance that the pregnancy will terminate favorably by death of the embryo and mole formation is less than fifteen per cent. The longer the pregnancy continues, the greater the danger to the woman. Mummification and lithopedion are uncommon terminations and even they are not without dangers. Continuation until near full term, with the hope of finally delivering by laparotomy a living child, is fraught with danger of almost certain death to the woman and offers only the meagerest hope of getting a child which will live more than a few days.

With operation the prognosis for the mother is better the earlier the operation is undertaken. The most favorable time is before rupture or abortion occurs, while operation is easiest, and while the woman's condition is at the best. Operation during abortion or rupture is more dangerous the more acute are the symptoms of shock and acute anemia. Infection also is more likely after hemorrhage has reduced the patient's resistance and after the abdominal cavity has been filled with such a good culture medium as blood and serum.

Operation for a mummified or calcareous fetus usually must be performed in the midst of many firm adhesions which mat together all the organs of the pelvis and many of those of the abdomen. Operation towards the latter half of gestation with a living or dead child

is extremely hazardous because of the danger from bleeding at the placental site or from sepsis.

TREATMENT

Treatment must be considered before rupture or abortion; near or shortly after rupture or abortion; at or near full term; and for mummification, calcification, and suppuration.

Before Rupture or Abortion

If diagnosis is made, most authorities strongly advise immediate removal of the ectopic sac, usually including the affected tube *in toto*. This operation is practically the same as for removal of the tube for pyosalpinx or other disorder. If one's scruples prevent him from removing a living embryo from the maternal tissues, he will keep his patient under constant observation in a hospital, with every preparation constantly ready for immediate laparotomy as soon as signs of rupture or abortion appear. At this time the embryo is already dead.

At Time of Rupture or Abortion

If the bleeding is only slight or has ceased, it is only necessary to remove the tube in the usual manner. In the presence of shock and marked hemorrhage, one passes his hand quickly down to the affected tube, brings it up to the incision, and clamps off the infundibulo-pelvic ligament and the tube between the gestation sac and the uterus. He closes the stump by mass sutures and gets out of the abdomen as soon as he can. If the condition is not very severe, he can take more pains with the removal of the tube and its proper suturing, and can remove most of the clots and serum from the peritoneal cavity.

At the time of beginning the operation an assistant should open a vein in the arm, preferably the median basilic vein, and allow about two pints of warm *normal salt solution* with a few drops of 1-1000 adrenalin solution to enter the vessels. Afterwards the salt solution can be continued by the drop enema method. If short of assistants, one may introduce the salt solution before and during the operation by hypodermoclysis.

In the cases of acute anemia due to rupture or to much hemorrhage

with abortion, one should *not stimulate* and should do nothing to heighten the blood pressure before beginning to operate. This for fear that hemorrhage already stopped may begin again as soon as the vessels are distended and the heart's impulse is restored. For the same reason, one must not give alcohol or strychnine or other stimulant for the fainting spell which accompanies the rupture. Rather is morphine in a dose of one-fourth to one-half a grain indicated to quiet the pain and to keep the patient from tossing about and so increasing the dangers of returning hemorrhage.

What should one do *in private practice* when he is called to a home to attend a woman in the condition due to the severe type of rupture, away from help, and far from proper surgical facilities? First he should give morphine hypodermically and should keep the patient in a reclining posture with the feet elevated. If she has fallen on the floor, let her stay there until it is safe to move her into bed. If the physician is a trained operator and can get aseptic conditions, he may operate as soon as he can obtain these conditions and proper assistance. If a hospital is near and the road is smooth he may remove her there.

It is not advisable for an *inexperienced operator,* without proper assistance and surroundings, to rush into the abdomen in order to stop a hemorrhage which has in most instances already stopped by the time he arrives on the scene. The danger from increasing the hemorrhage and the danger of infection with peritonitis are, under such circumstances, greater than expectant treatment with morphine and absolute rest.

At or Near Full Term

Whether the fetus is alive or dead, one should remove it and the products of conception as soon as possible. If alive it is viable and has better chances if removed from the belly than if left to grow larger.

The operation is practically a *Cesarean section* except that the child and secundines are not within the uterus, but in a sac formed by the tube walls or usually by the omentum and other peritoneal folds adherent to different organs of the pelvis and abdomen.

The trying part of such an operation is the *treatment of the placenta*. There are three methods: First, remove the placenta manually and pack the sac and placental site to prevent bleeding.

Of course there is no chance of the hemorrhage being stopped by contractions of the sac. Second, cut the cord close to the placenta and pack the sac lightly, leaving the gauze protruding from the wound as in the first method. This method is sure to be followed by infection, prolonged and extensive suppuration, sepsis and usually death. Third, it has been proposed but so far never practiced, to
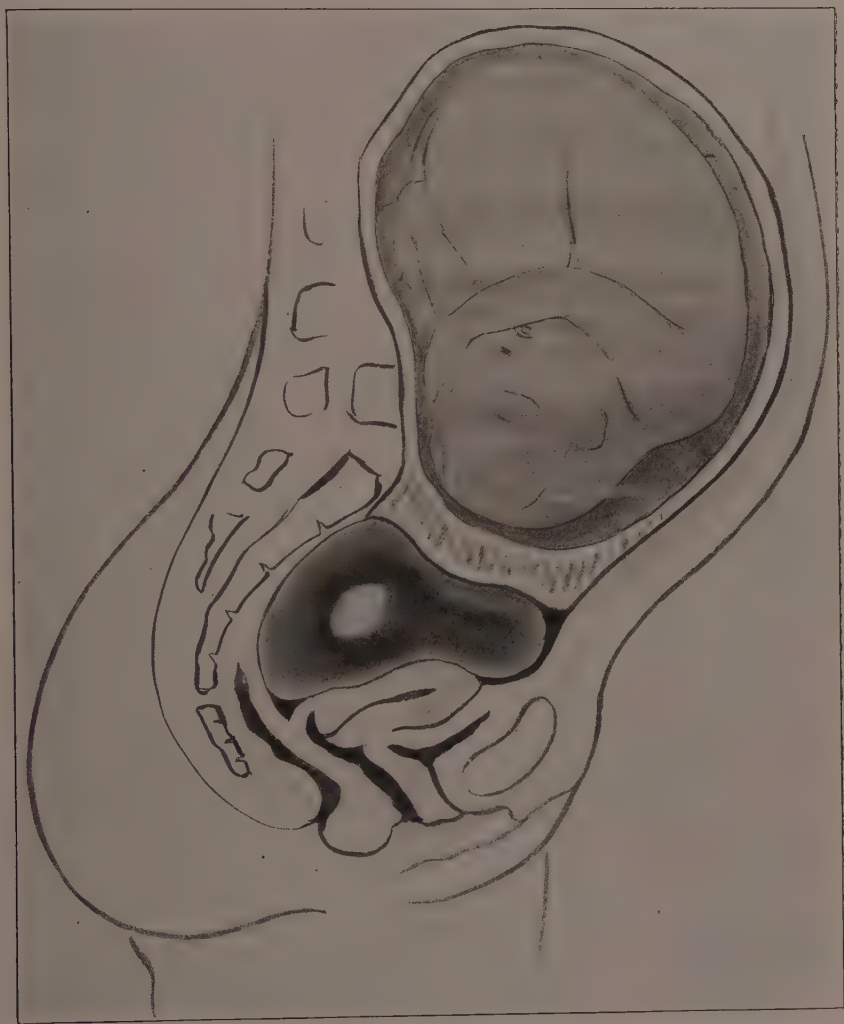
Fig. 175.—Abdominal pregnancy complicated by ovarian cyst. (Author's case.)

cut off the cord close to the placenta, leave the placenta in situ and
close the abdomen without drainage.

The first two methods are recommended by authors of equal reli-
ability. To remove the placenta manually and trust to packing to
stop hemorrhage means a terrific loss of blood. The placental site
must be firmly packed with five yard strips of gauze, filling the sac
completely. A snug abdominal binder fastened tightly to a vulvar
pad must be put on to hold down the packing against the placental
site. The packing should be removed on the third day. The woman
must be kept at absolute rest and will usually need morphine to
keep her quiet.

The second method, of leaving the placenta and packing the cavity,
is open to the objection that a large mass of tissue is left in the
depths of the abdomen, which will surely become necrotic and in-
fected and will serve for weeks and months, if the patient lives that
long, as the continual source of foul infection for the abdominal
cavity.

The third method awaits some bold man. If asepsis is perfect,
there is a good chance that the placental remains will be encapsulated
and finally absorbed.

CHAPTER XVIII

SYMPTOMATIC DISORDERS

There are certain symptoms and groups of symptoms characteristic of various diseased conditions of the female genitals or peculiar to the female organism in general which are not of themselves scientifically classified as disease entities. These symptom-complexes merit study because of their diagnostic relations to pathological processes, or because they are often present when their relations to definite pathological processes can not be made out. Some of them even require symptomatic treatment although their ultimate causation can not be determined. At least they may be important for consideration because study of their etiology in particular cases may lead to the perfection of a scientific diagnosis.

Among these symptomatic disorders are disturbances of menstruation; genital hemorrhages, and sterility.

DISTURBANCES OF MENSTRUATION

Among the disturbances of the menstrual function are precocious menstruation; delayed menstruation; amenorrhea; and dysmenorrhea.

Precocious Menstruation

Normally, in this country, menstruation first appears between twelve and seventeen years of age. It is not very rare for girls to begin their menstrual life at eleven or even ten, but under nine years old menstruation must be considered precocious. There is usually a correspondingly premature development of the genitals, the breasts and the whole body. The precociously menstruating girl of six or seven years will have the bodily size and development of thirteen or fourteen. In a few cases the mental development will be precocious, but in more the mentality will be below normal, even to the extent of idiocy.

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ETIOLOGY

The etiology is very obscure. There seems often to be some heredi-
tary factor. Excessive fertility in the mother and the grandmothers
is commonly reported. In many cases hyperplasia of the ovaries
seems to play a part. Rectal examination has many times revealed an
ovary enlarged beyond adult size.

In a few cases sarcoma of the ovary has been observed. Rachitis
seems to be present in greater frequency than among other children.
Rudel found cysts, tuberculosis, or sarcoma of the ovary in five out
of the six cases observed by him.

The age of the first menstruation varies in the reported cases from
six months upwards. A surprising number menstruate during the
first year of life. The menstruation, to be truly precocious, must be
a regular periodical bleeding. The single hemorrhage which some-
times occurs in the new-born or in very young children is not men-
struation. Sometimes the blood comes from the rectum. Sometimes
the bleeding from the genital tract is due to infection (often gonor-
rheal) of the vulva and vagina. Sometimes red stains on the napkins
are due to uric acid crystals in the urine.

TREATMENT

Therapy is essentially *hygienic and protective*. The external gen-
itals should be examined and any source of irritation should be re-
moved. Masturbation and sexual excitement should be prevented by
watchful care and tactful advice. Association with the opposite sex
should be discouraged lest illicit coitus occur, under the temptation of
adult desires in an individual of puerile mentality and will. It is,
however, a rather strange fact that, of the numerous cases of pre-
cocious pregnancy in girls under ten years, it is rare to read of pre-
cocious menstruation. Most young girls who become pregnant at
such early ages have never menstruated.

Delayed Menstruation

ETIOLOGY

When the first menstruation does not appear before the sixteenth
or seventeenth year it may be called delayed. The condition is not
uncommon and may be compatible with perfect health. Of course,

absence of menstrual flow due to imperforate hymen or absence due to pregnancy beginning before the first menstruation, which never appears because of repeated pregnancies and lactations, could hardly be counted as delayed menstruation.

Girls whose menstruation is delayed are usually *not well developed* either genitally or generally. Overwork, insufficient food, poor housing and hygiene, chlorosis, tuberculosis and other wasting diseases are frequent causes. Among the well-to-do obesity is a common cause. Underdevelopment of the uterus and ovaries may be a cause.

Diagnosis is made from the failure of menstruation, and examination is undertaken to find the cause. Bimanually one may feel a very small infantile type of uterus and will fail to find ovaries or will palpate very small ones. The vulva and vagina are often poorly developed, as well as the breasts, pelvis, and panniculus adiposus.

Treatment

Where the cause of the delayed menstruation is a *general underdevelopment* or debility, treatment should be directed to building up the patient's general health, by forced feeding, rational mode of life, exercise, sleep, fresh air, and ferruginous and arsenical tonics.

Where the cause is *underdevelopment of the genitals,* little can be done. Iron and manganese in liberal doses, added to general tonic and hygienic treatment, should be employed. Marriage, with its consequent stimulation of the genitals, will sometimes cause increased development because of increased blood supply. If pregnancy ensues, the cure is usually effected. The stem pessary has been recommended as a local stimulus to hyperemia. The dangers from trauma and infection are too great a price to pay for its doubtful efficacy. Dilatation of the cervix and internal os under aseptic precautions is less dangerous and more efficacious.

Amenorrhea

Amenorrhea is the *absence of menstruation.* Scanty menstruation may be defined as a menstrual flow less in amount than usual or less than the normal for the individual. Amenorrhea may be physiological and pathological.

Physiological amenorrhea is absence of menstruation due to normal and physiological causes. These causes are juvenility, pregnancy,

lactation, and senility. Except in precocious individuals, menstruation does not begin before puberty; indeed, in the girl menstruation is the most important sign of puberty.

Pregnant women seldom menstruate, almost never after the first two months. During the earlier months of lactation, menstruation and, to a less extent, ovulation are in abeyance. After the climacteric menstruation ceases. If bleeding from the genitals does not cease at this period, serious disease should be suspected.

Pathological amenorrhea is cessation of menstruation due to some abnormal condition. The causes of physiological amenorrhea, especially pregnancy, must be rigidly ruled out before one makes a diagnosis of the pathological variety. Delayed menstruation, as already discussed, is, of course, a variety of pathological amenorrhea.

Etiology

Pathological amenorrhea may be due to absence, disease, or imperfect development of the genital organs, to general imperfect development of the whole body, to many general diseases, acute and chronic, or to psychic disturbances. Absence of menstrual flow due to imperforate hymen or other atresia of the genital canal can not be classified as amenorrhea, because menstruation actually occurs, although the blood is retained within the canal. All the phenomena of the process take place except the appearance of blood outside the canal.

Absence or marked underdevelopment of the uterus must cause amenorrhea because the essential functions in the process performed by the endometrium are absent. Ovulation and internal secretion by the ovary or the corpus luteum will proceed normally if the ovary is normal, although the endometrium may be unable to respond to the stimulus of those secretions. A woman whose uterus has been removed will have many of the symptoms of menstruation except such as are due to the uterus, and will probably retain most of the sexual feelings, provided that enough ovary has been left to insure sufficient internal secretion. So also a woman who has had both tubes removed or occluded will be able to perform all sexual functions except childbearing, but including menstruation.

In some instances the sexual organs appear, even to most careful examination, perfectly normal, and yet the woman has amenorrhea.

In such cases some or all of her sexual organs are *functionally inactive* although well developed. Amenorrhea is not uncommon in athletic young women, professional acrobats, and dancers. Excessive muscular and excessive mental exertion seem to inhibit sexual activities in both sexes. Hard working mares, especially if they are also underfed, do not have heat so often or so regularly as those not so treated.

Absence or marked maldevelopment of the ovary or disease of the ovary which destroys much of its substance is followed by pathological amenorrhea, almost always permanent. Complete removal of all ovaries (sometimes there are more than two) causes cessation of the menstrual function. The amenorrhea which is often observed in cases of large ovarian cyst is probably caused by the general debilitated and anemic condition rather than by lack of ovarian substance.

General underdevelopment of the body often causes amenorrhea. Often, it is true, the ovaries or other pelvic organs share in the poor development. In some cases, however, while the genital organs appear to the usual examination to be normal, the general hypoplasia seems to induce functional inactivity of the organs concerned in menstruation.

Constitutional disorders, acute and chronic, often cause cessation of the menses. Among these are general debility from any cause, anemia, chronic heart, kidney or lung disease, tuberculosis, syphilis, the leukemias, gastrointestinal disorders, etc. In any of the acute diseases, it is usual for menstruation to fail during the active phase and often for some time during and after convalescence. Anemia is the key-note in all these causes. Obesity is a common cause of lack of sexual activity in both sexes. Probably the associated anemia is the direct causal factor.

Certain **psychic disturbances** sometimes cause suppression of the menses. The shock of great grief, the fear of illegitimate pregnancy, change of climate, change of residence, or change of mode of life sometimes lead to amenorrhea. This seldom lasts longer than one or two months. In some instances of immigrants coming to this country amenorrhea will continue for several months. There is seldom any other symptom present, and no harm is done except the mental distress of the patient and her friends due to the prevalent idea that absence of menstruation is in itself a serious matter.

Treatment

It must be borne in mind that amenorrhea is merely a result of some underlying cause, and is not in itself a disease entity. In some cases the cause can not be determined; in some it is of no serious moment; in some it is incurable. When possible and necessary, the cause must be treated.

On the other hand absence of menstruation appears to the patient and her friends, and indeed too often to the physician, in the light of a serious physical defect which must be remedied at almost any cost. Such a view of the importance of amenorrhea *per se* accounts for the large array of therapeutic measures recommended and employed in the treatment of amenorrhea.

In itself amenorrhea does no harm. The harm is because of the underlying cause or because of the psychic effect upon a patient of neurasthenic or hysterical tendencies.

The great majority of patients who come for treatment for amenorrhea have been subjected to the *possibility of pregnancy.* Many come hoping to induce the doctor to prescribe an emmenagogue or take some operative measure which will interrupt gestation. One must ever be on his guard lest he inadvertently produce an abortion.

There are no drugs which can be relied upon to produce menstruation. Obviously it is absurd to believe that any therapeutic measures at our command can possibly set in motion the complicated processes of ripening of the ovum, its discharge from the follicle, the formation of the corpus luteum, the internal secretion from the ovary, and the changes in the endometrium which constitute menstruation.

Treatment addressed to the cause covers the whole field of medicine. Chlorosis and anemia require iron, manganese, arsenic, nutritious diet, rest and proper exercise with abundance of fresh air. General chronic diseases must be treated according to principles of general medicine. Amenorrhea due to malformations and disease of the genital organs must be treated as already mentioned in the parts of this book devoted to these subjects.

Aside from the causes and the psychic effect, amenorrhea requires no treatment. In a few instances, however, it is justifiable to take measures directed towards the amenorrhea itself. In acute suppression of menses which sometimes arises from exposure to cold, some strong psychic shock, cold douches or other marked nervous stimulus,

it may be necessary to use cathartics, especially aloes, hot douches, hot sitzbaths, and rest in bed. In every case one must assure himself that pregnancy is absolutely ruled out of consideration. This is usually very difficult.

The only reason for trying to *"bring on the menses"* at all, except as we treat the conditions which cause their nonappearance, is the discomfort sometimes felt in the pelvis and the bad mental effect on a nervous patient of their suppression. When there are marked symptoms, such as great pain in the pelvic region, in the back, etc., we usually are dealing with obstruction or with retroversion or with other anomaly of the uterus, which must be treated accordingly.

Vicarious Menstruation

Various organs and tissues may be affected during the menstrual period and some of them show occasional hemorrhages in cases of amenorrhea, either temporary or permanent.

The **breast** is in rather close relation, in function and appearance, to the genital organs. Disturbances in one are frequently connected in point of time with disturbances of the other. A so-called vicarious bleeding from the nipples is not infrequent at the menstrual period, when normal menstruation is absent or scanty.

Bleeding from the nose is the most common vicarious hemorrhage taking the place of the normal flow. Similar hemorrhages have been noted from the kidneys, intestines, lungs, conjunctiva, and other localities. One case is reported of vicarious hemorrhage from leg ulcers during temporary amenorrhea.

Dysmenorrhea

Dysmenorrhea means *painful menstruation.* Even under normal circumstances menstruation is often not entirely painless, but is accompanied by varying degrees of discomfort. Like pregnancy and labor, it is a physiological process which borders on the pathological and occasionally goes over the border. If the pain is enough to interfere with the patient's ordinary routine, the condition may be characterized as dysmenorrhea.

Etiology

The symptom may be caused by a great variety of conditions. It is by no means always associated with appreciable abnormality of the pelvic organs.

Among young women and girls the more common causes are imperfect development of pelvic organs, neurasthenia, psychosis, and general debility due to anemia, chlorosis, or wasting diseases. In other words, some causes which may produce amenorrhea will, when acting to a lesser degree, produce painful menstruation. This is often accompanied by scanty menstrual flow.

In *older women* dysmenorrhea may be caused by pelvic infection of various types and degrees, by uterine displacement, especially prolapse and by uterine tumors, especially fibroids.

Treatment

Imperfect development of the pelvic organs, especially the uterus, as a cause of dysmenorrhea has been discussed in the chapter devoted to Anomalies of the Female Genitals. The essential feature of the pathology of these cases is that there is a faulty development of the muscular fibers of the uterine wall with replacement of those fibers by the more primitive connective tissue fibers. Therefore, when the congestive stage of menstruation comes on, the nerve filaments in the uterine wall are compressed by the swelling. Because of preponderance of the nonelastic fibers the nerves are caught between them instead of being cushioned by the normal amount of muscular fibers.

In **infantile uterus** the whole organ fails to expand with congestion; in congenital uteroflexions the poorly developed portion of the uterine wall at the location of the kink fails to expand. Therefore pain results.

Neurasthenic patients exaggerate any and all discomforts into pains. Such patients complain of pain associated with menstruation. The condition of nervous exhaustion must be treated according to appropriate measures. It must not be forgotten that patients suffering from neurasthenia and psychoneurosis are frequently subject to absorption of toxins from the intestinal tract or from some other source of infection in the body.

In such cases the source of the *autointoxication* must be found and

appropriately treated. The same principles of proper general treatment and treatment directed to the cause of the symptoms applies to dysmenorrhea in anemia, chlorosis, and general wasting diseases. Each case must be studied in relation to the underlying cause, and treated accordingly.

Dysmenorrhea due to pelvic disorders, uterine displacements and uterine tumors depend upon local pressure on nerve ends imprisoned within cicatricial tissue or tissue abnormally supplied with connective tissue elements. Menstrual congestion causes pain because the abnormal tissues fail to expand with the increased amount of blood.

In prolapse and in most of the other pelvic disorders here considered, there is interference with venous return through the vessels of the broad ligament. Therefore swelling of the tissues at the time of menstrual congestion is increased beyond the normal, and the usual menstrual discomfort is magnified into pain.

There remain certain cases where painful menstruation is manifested, but *where no general or special causative factor* can be demonstrated or where the *pain as an emergency symptom* must be considered. The number of such cases will be fewer in the practice of men accustomed to careful study of their patients and careful differential diagnosis than in that of men accustomed to prescribe off-hand.

There is, however, a legitimate treatment for dysmenorrhea itself just as there is a legitimate emergency treatment for constipation. The former sometimes requires treatment directed to pain *per se* just as the latter sometimes requires cathartics. In both instances one should find and remove the cause if possible.

Morphine or other **opiates** will of course relieve dysmenorrhea like any other variety of pain. These drugs are, however, never indicated in treatment of dysmenorrhea. The relief is only temporary and the immense danger of habit formation is too big a price to pay for ephemeral relief from pain. The same principle applies to **alcoholics.** Make a woman half drunk, and she will be relieved of her dysmenorrhea for the time. It must not be forgotten that many of the lauded remedies for "painful menstruation" contain much alcohol.

The **bromides** are sometimes indicated, especially in very nervous patients. If used the bromide should be pushed; 20 to 40 grains

three times a day for several days before menstruation is not too much. The drug tends to lessen pelvic congestion and is sedative.

Apiol may sometimes be useful in doses of 2 to 5 minims in soft capsules three times a day. It is especially useful in so-called uterine colic due to faulty development of the uterine wall locally or generally.

Cannabis indica is sometimes useful, but is open to the dangers of habit formation. It is given in doses of 10 to 15 minims of the tincture every three hours. **Gelsemium** may advantageously be combined with it.

Viburnum prunifolium formerly was much vaunted as a remedy in dysmenorrhea, and indeed in almost all pelvic disorders in women. Many of its preparations contain much alcohol or carminatives and some contain cathartics. Unloading of the bowels often acts favorably of itself. The rest of the effect is that of the alcohol.

Of late, **pituitrin** has been recommended in doses of 1 c.c., p.r.n. **Thyroid** extract in doses of 5 grains every four hours, beginning a day or so before the period and continuing until pain is relieved, has been recommended on the basis of a large number of favorable case reports. **Dioxide of manganese** in doses of 3 to 5 grains four times a day often acts well, especially in cases where the menstruation is scanty. **Adrenalin** and **atropin** have proved useful in some types of cases.

Physiological therapy, in the form of hot general baths or hot sitzbaths, will often relieve the less severe cases. The water in the bath should be as hot as can be borne and should be increased from time to time by addition of hot water, always keeping the temperature well up to the point of endurance. The patient should sit in such a bath for an hour or more. Hot douches and warm colonic flushings are often valuable adjuvants to hot baths.

A mild **galvanic current** with large electrode over the abdomen and smaller at the vulva or at the cervix will often give relief.

Operative treatment will sometimes relieve dysmenorrhea not associated with palpable organic lesions or general ill health. This procedure should consist only of wide dilatation of the cervical canal and internal os by means of graduated or branching dilators. Formerly curettage was performed at the same time. It is doubtful whether this last adds anything to the beneficial effect at all proportionate to its dangers.

Dilatation gives permanent relief in about one-third of the cases

of the class under consideration; temporary relief for a few months in over one-third; while more than one-fourth are not benefited at all. The cases which one may reasonably expect to relieve are those in which the pain is sharp in character and precedes the flow by a few hours. Perhaps much of the benefit is due to the psychic effect upon neurasthenics combined with the rest in bed which is often ordered afterwards.

Nasal dysmenorrhea is a term sometimes applied to a painful menstruation which seems to be associated with certain disturbances of the nasal mucous membrane. Fliess found certain spots on the turbinates which he called ''genital spots,'' and learned that some cases of dysmenorrhea could be benefited by touching these spots with cocaine solution. Others have found that cocainization of the posterior nares often stops the acute pain in some forms of neurotic dysmenorrhea. Kolischer, of Chicago, claims equally good effect from mopping the nasal septum with normal salt solution.

Membranous Dysmenorrhea

Membranous dysmenorrhea deserves mention in this connection merely because of its name. It is a rather rare disease, characterized by severe contracting pains during and before the establishment of the flow, with expulsion of more or less exfoliated endometrium; sometimes an entire cast of the uterine cavity. In typical cases the pain is very intense, and ceases when the membrane has been expelled.

Etiology.—The disorder occurs most commonly in virgins and sterile women, but is not unknown in multiparæ. It has been supposed to be due to endometritis, and gets a name—*exfoliative endometritis*—from that theory. It is now believed to have little or nothing to do with endometritis or with infection of any kind. All of the pelvic organs may be found apparently absolutely normal. Probably the condition is due to an *excessive secretion from the ovaries*, unduly stimulating the uterus; an intensive working of ovarian hormone.

The disease must be *differentiated* from early abortion, which it resembles in its symptoms. Its recurrence so frequently, often every month for long periods, is one diagnostic point. The crucial test comes from microscopic examination of the expelled portions of membrane. There are no signs of villi or other elements of chorion

in the membrane of dysmenorrhea, while these will always be present in abortion.

From expelled decidua in cases of ectopic pregnancy one must differentiate by the failure to find evidence of the ectopic sac in membranous dysmenorrhea, and by the relative infrequency of repetition of ectopic pregnancy.

Treatment is very unsatisfactory. Dilatation and curettage relieve some cases for a time. The mild cases may get permanent relief, but the effect is least in the severest cases, the very ones which call loudest for treatment. Sometimes repetition of the dilatation and curettage will give better results; often the operation is repeated several times. If pregnancy occurs, the condition is sometimes cured thereafter; but such a termination is exceptional.

In severe cases, which make life a burden to the woman, it is justifiable to perform *hysterectomy or removal of ovaries*. Acting upon the present theory as to its causation, membranous dysmenorrhea may be treated with some hope of success by *resection* of a good part of the cortex of both ovaries.

GENITAL HEMORRHAGES

Bleeding from the female genitals is almost always *from the uterus*. There are some exceptions, as follows:

In the new-born and young children blood may stain the diaper from the kidney, bladder, or rectum in cases of hemophilia; from gonorrheal infection of the vulva and vagina; from trauma to the external genitals during birth, as in breech presentations.

In adult women traumatism, ulceration or varicose veins of the vulva or vagina may be the cause of hemorrhage which appears externally. Rarely a virulent infection of the vulvovaginal glands may take on a hemorrhagic aspect.

Uterine hemorrhages are commonly divided into *menorrhagia* and *metrorrhagia*. Menorrhagia means excessive menstrual flow beyond normal for the individual. Metrorrhagia means bleeding from the uterus at times unassociated with menstruation. Menorrhagia exists when the flow is considerably in excess of the normal, during the entire period, or when the period is unduly prolonged. A common method of measuring the amount of the menstrual flow is to note the

number of napkins soiled and the extent of soaking of each. Any hemorrhage in the intervals between the menses is abnormal.

Practically the same causes are involved in both menorrhagia and metrorrhagia. Therefore the line of demarcation is chiefly of academic rather than practical interest. When the mucous membrane of the uterus is congested, as at the active stage of menstruation, the same cause may increase the flow which would be likely to cause more or less bleeding during the menstrual intervals.

Etiology

The causes of uterine hemorrhage are local and general.

The chief *local causes* are abortion, placenta previa, etc.; endometritis, retrodisplacement, tuberculosis of internal genitals, malignant disease, fibromyoma, mucous polyp, placental polyp, fibrosis, and subinvolution; ovarian, tubal, and peritoneal causes.

The chief *general causes* are constitutional diseases, such as hemophilia, purpura, septic infection, malaria, and syphilis, which act by alteration of the character of the blood; anemia and chlorosis, which usually, however, cause scanty menses or amenorrhea; heart disease, sclerosis of the liver, emphysema, and tumors of abdomen and pelvis, all of which act by obstructing the flow of venous blood. Young girls often menstruate excessively when recovering from some of the acute infectious diseases, such as the exanthemata or pneumonia.

Abortion, threatened, complete or incomplete, is probably the commonest cause of uterine hemorrhage. Under this heading may for convenience be included the other abnormalities of gestation characterized by hemorrhages, such as placenta previa, placenta ablata, hydatidiform mole, and rupture or abortion of an ectopic pregnancy.

In determining the cause of a given uterine hemorrhage, the patient's age and general condition must be considered. In a breathless, cyanotic woman, cardiac disease would be immediately suspected. In a woman of fifty, cancer of the uterus would be the first thought. In an unmarried woman between thirty and forty-five, fibromyoma would be suspected. In a married woman of the child-bearing age, abortion would be the most probable diagnosis.

Diagnosis

Abortion should be first considered in all cases of hemorrhage in women at the fruitful age. Often this occurs before pregnancy has

been suspected. An isolated instance of excessive menstruation may well be an example of abortion instead. Especially suspicious is delay of flow for a few days and then abnormal bleeding.

Threatened abortion is manifested by cramp-like pains due to contractions, later bleeding from the os due to separation of the decidua or placenta. Clots are characteristic of this form of hemorrhage. When pains, hemorrhage, and beginning dilatation of the cervix are all present, the case is one of *inevitable abortion* and should be so conducted. When shreds of decidua or placenta are passed with the clots, or when part or all of the embryo is passed, the abortion is known as incomplete. In this last stage of abortion there is often considerable hemorrhage, alarming because of its immediate extent or because of a long continued drain of blood. Signs of acute or chronic anemia become manifest.

When a woman, subject to the chance of pregnancy, misses one or more menstruations and then has slight bleeding from the vagina which differs in quantity, color, or appearance from her usual flow and also some pain referred to one side of the pelvis, she is probably suffering from an *abortion of an ectopic pregnancy.*

So-called *endometritis*, especially of the catarrhal type, due to passive congestion of the uterine mucosa from various causes, is usually accompanied by menorrhagia. Leucorrhea between the periods is often troublesome. The discharge is composed largely of mucus, usually thick, from the increased activity of the muciparous glands of the endocervix. The uterus is somewhat enlarged, the cervical canal is patulous, the uterine tissues are somewhat softened, and there may be tenderness on pressure.

Retrodisplacements of the uterus, because usually accompanied by prolapse or by pelvic adhesions, are usually marked by symptoms of congestion, and therefore of catarrhal endometritis as just described. Menorrhagia is, therefore, a common symptom of pathological backward displacements of the uterus. Backache, feeling of weight and bearing down, and leucorrhea are commonly present. Bimanual examination will perfect the diagnosis.

Tuberculosis of the internal genitals may cause increased menstrual flow because of congestion incident to the disease and to the pelvic adhesions commonly associated with tubal tuberculosis. Tubercular endometritis is sometimes in itself a cause of menorrhagia.

The diagnosis will be made from other signs of tuberculosis elsewhere in the body, or will be made accidentally in the course of operation for salpingitis.

Malignant disease of the uterus is a common cause of menorrhagia in women over forty, by increasing the blood supply on account of the irritation produced. Often it is a cause of metrorrhagia later in life, because of ulceration and destruction of blood vessels. The hemorrhage is likely to be persistent, often is severe, and may rapidly produce profound anemia.

Carcinoma of the uterus is usually first indicated by hemorrhage or by reddish discharge. Pain is seldom an early symptom, rarely appearing before the cancer has extended beyond the uterus. In any woman over thirty, but especially over forty, cancer as a cause of uterine hemorrhage must always be suspected and ruled out before anything but a grave prognosis can be essayed.

Cancer of the cervix occurs most commonly in multiparæ between the ages of thirty-five and forty-five, rarely in nulliparæ. Bleeding occurs at irregular intervals and with varying severity. Often a few drops or a mere stain will be enough to cause suspicion. Later the discharge becomes dark and foul smelling and mixed with necrotic masses.

In early stages, bimanual examination shows the cervix to be hard, slightly enlarged and, in cases of carcinoma within the cervical canal, rather bluish. Carcinoma of the portio (epithelioma) will be manifest to the eye as a reddish velvety projection above the surface, usually at the margin of the os or in the cleft of an old laceration. In cases of doubt, a piece should be snipped off and carefully examined histologically.

In more advanced cases the vaginal vault will be filled with a cauliflower-like mass which easily bleeds on contact and which easily breaks down and bleeds freely. In advanced cases of cancer of the cervical canal the cervix may remain as a deep conical crater due to ulceration and surrounded by a hard base.

Cancer of the body of the uterus usually appears some time after the menopause or the menopause is apparently delayed for a time. Bleeding is seldom profuse. Often there is merely a reddish serous discharge, often with a meaty or slightly cadaveric odor. The body of the uterus is enlarged up to the size of two months pregnancy,

rarely larger. The cervix is seldom involved. The course of the disease is slower and less malignant in character than is cancer of the cervix or portio. Any supposed return of the menses or irregular hemorrhage in a woman over forty in whom the uterus is not greatly enlarged should be provisionally diagnosed as cancer until proved otherwise. In case of any doubt, such a suspected uterus should be removed.

Sarcoma of the uterus is rare, even the type found in degenerating fibroids. It usually occurs in younger women than those liable to carcinoma. The symptoms are similar to those of carcinoma. The diagnosis is made from the microscopical findings.

Chorioepithelioma malignum, a carcinoma which originates from villous epithelium remaining after a labor, abortion or cystic mole, occurs in younger women than those susceptible to carcinoma of other varieties. The diagnosis is suspected because of persistent hemorrhage after abortion or labor, especially when it recurs after curettage. Microscopical examination of the curetted material usually makes the diagnosis.

Fibromyoma of the uterus, especially of the submucous or intramural variety, may cause hemorrhage from the uterus. The bleeding may be menorrhagic or may occur at irregular intervals between the menses and in varying amounts. Often the aggregate loss of blood from a few copious hemorrhages or from frequently repeated small ones is so great that a high degree of anemia results. The hemoglobin content often drops below twenty per cent and the red blood count below two million.

The uterus is enlarged, usually nodular and of varying consistency in different places. There is often a history of sterility for a prolonged period. The disease is a little more common in nulliparæ. Pain in the back, pain in the pelvis from pressure, disturbance of function of bladder and rectum, dysmenorrhea, and signs of pelvic congestion are common symptoms.

Mucous polyp, a tumor composed of localized hypertrophy and hyperplasia of the uterine mucosa, is a frequent cause of hemorrhage. The bleeding is menorrhagic, or metrorrhagic, or both. The loss of blood is sometimes considerable. The polyp is gradually forced outwards and often appears at the os or even in the vaginal canal. Hemorrhage comes from the substance of the tumor itself and from the congested endometrium elsewhere.

Placental polyp is a tumor composed of postabortive blood clot which has become partially organized and retains its attachment to the uterine wall. The pedicle contains remains of decidua and chorionic tissue. The condition represents a chronic variety of incomplete abortion. The uterus is slightly enlarged, the hemorrhage is persistingly frequent although rarely copious.

The diagnosis is usually made after dilatation preparatory to curettage. The finger in the uterus can feel the tumor as a soft pedunculated mass attached to some part of the wall. The microscope determines its histological character.

In women at or just beyond the menopause persistent bleeding from the uterus is sometimes caused by a condition known as **fibrosis.** In this state the uterine muscles, especially in those who have borne many children, has become largely replaced by connective tissue fibers. The uterine wall, therefore, in many places lacks the elasticity of the normal musculature. The fibrous tissue does not elastically compress the uterine vessels and arterioles, but rather holds the lumen of the vessel open so that hemorrhage is favored when any cause arises which tends to congestive enlargement of the uterine vessels. Such a condition is sometimes known as *arteriosclerosis* of the uterus but is not strictly such in a pathological sense.

Subinvolution of the uterus, a condition of subacute or chronic postpartum infection, will often cause uterine hemorrhage, especially of the menorrhagic type. Passive congestion of the tissues of the endometrium and musculature due to interference with venous return on account of the swelling due to the infection is the immediate cause of the bleeding.

Disease and tumors of the **ovaries or tubes** may cause uterine hemorrhage by interference with pelvic circulation and consequent congestion of the endometrium. The type is usually menorrhagic. Adhesions consequent upon former infection of the pelvic peritoneum accompanying tubal, ovarian, or uterine infection act by interfering with return blood flow from the uterus via the broad ligament, thereby causing uterine congestion and consequent menorrhagia.

A number of **constitutional diseases** are frequently associated with hemorrhage from the uterus, especially menorrhagia. Hemophilia, purpura, general sepsis, malaria, and syphilis may so alter the blood that the uterine tissues are poorly nourished and the vessels

impaired. Hence hemorrhage may ensue from any part of the body which may be injured or congested. Therefore the endometrium, subject to the periodical congestion of menstruation, may be the place of hemorrhage.

Anemia and chlorosis, because of poor nutrition of the tissues and vessels, may cause bleeding from the congested endometrium in certain cases. Heart disease, especially mitral regurgitation and stenosis, sclerosis of the liver, emphysema of the lung, and abdominal tumors, may induce passive congestion in the pelvis and also in the uterus, which may be the direct cause of the menorrhagia.

Treatment

Hemorrhage from the uterus requires the appropriate treatment *indicated by its cause*. The *local condition* causing bleeding should be corrected or removed by operation or otherwise. The *general condition* should be treated according to general medical principles. There remains, however, the case where hemorrhage itself must be treated, regardless of the cause or in spite of the cause.

The patient must have perfect *rest in bed*. She should not rise for any purpose, therefore, the bed-pan must be used. She must have mental rest, therefore, visitors should be reduced to a minimum. Absolute sexual rest is imperative.

Her *diet* must be adapted to the treatment of anemia. It must be simple, nourishing, and easily digested; in the form of small and frequent meals. Iron in some easily assimilable form will usually be indicated. Arsenic is sometimes useful.

Tamponade is necessary if the hemorrhage is severe or frequently repeated. If the os is not dilated, the vagina must be packed snugly with a long folded strip of gauze. This is better than cotton pledgets because gauze is easier to place and remove. Counter pressure is obtained by a snug abdnormal binder and by a vulvar pad pinned to the binder front and back.

When the os is dilated, especially in cases of incomplete abortion, the uterus itself should be packed by narrower strips of gauze than used for the vaginal pack. The cervix should be drawn down as far as possible by a vulsella and the gauze packed firmly into the uterine cavity under the guidance of the eye. Such packing should be removed in the course of twenty-four hours and replaced if necessary.

Hot vaginal douches are of value in controlling menorrhagia. They should be given twice a day, during the interval between the menses. The water should be as hot as can be borne (110° F.), and the quantity of each douche should be several quarts. The douches may be omitted during the actual flow, but may be given then if indicated.

In cases of recurrent or persistent hemorrhage not due to incomplete abortion, uterine fibroids or cancer of the cervix, **curettage** is sometimes indicated.

Ergot is the most reliable drug for stopping the hemorrhage. It may be given in doses of 20 to 30 minims of the fluid extract every three or four hours. The prolonged use of ergot, on account of its action in contracting arterioles, is bad for the heart, in that it puts too great a load on that organ. Ergot is best given only when the uterus is empty of tumors, foreign bodies, or products of conception. It acts by contracting the intrinsic muscles of the uterus, and thereby compressing its vessels. It is, therefore, useless in hemorrhages which are due to some cause outside of the uterus.

Cotarnine, whose hydrochloride *stypticin* is the preparation commonly used, is valuable in many forms of hemorrhage, especially those where ergot seems to have no control. The dose is one grain three times a day for beginning, increased to every three or four hours when the actual hemorrhage starts. It is especially adapted to cases of excessive menstruation due to general causes. It should be given in capsules.

STERILITY

A woman is said to be sterile when, having had the opportunities for conception, she is unable to give birth to a living child. In *absolute sterility* conception does not occur; in *relative sterility* the patient can become pregnant, but is unable to bring gestation to a successful issue. *Voluntary sterility* may result from abstinence, and from successful efforts to prevent conception by means of drugs, mechanical appliances, or peculiar methods of coitus.

In *"one-child sterility"* the woman bears one child and never another. Sometimes her first pregnancy ends in abortion and thereafter her powers of conception cease. *Physiological sterility* exists before puberty and after the climacteric. Indeed most women become

sterile several years before the menopause. In lactation, unless unduly prolonged, sterility is usual.

Etiology

Formerly it was considered that the cause of sterility lay with the woman, provided the man was capable of coitus. It is now known that about 15 per cent of childless marriages may be laid at the husband's door. *Potentia coeundi* does not necessarily mean *potentia*
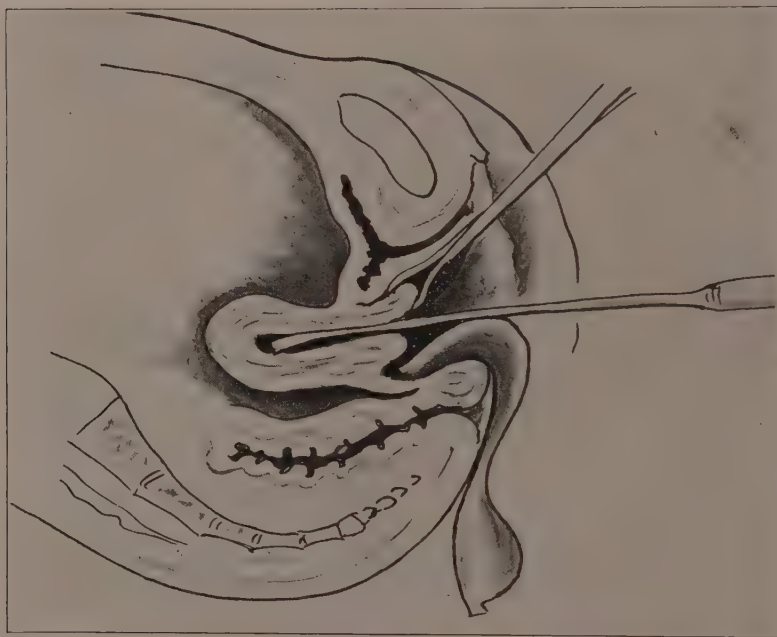
Fig. 176.—Section of pelvis showing method of curettement.

generandi. There may be no discharge of semen, the semen may contain no spermatozoa, or the spermatozoa may be undeveloped or diseased. If no probable cause of sterility can be demonstrated in the wife, the husband's semen should be microscopically examined for spermatozoa.

Poor general health may prevent ovulation as it sometimes prevents menstruation. Proper diet and treatment of the general condition may be followed by resumption of function on the part of the genital apparatus with consequent conception and child-bearing.

Obesity has long been recognized as a cause of failure to conceive. The reason may be anemia which often coexists, or interference by the deposits of fat with the functions of the ovaries and other genital organs. Incomplete intromission with consequent draining away of the semen from the vagina may result, especially if both parties are very corpulent. Conception is rare in advanced cases of *hyperthyroidism*.

Habitual use of certain **drugs**, especially morphine, may cause sterility. Chronic lead poisoning and chronic ergotism are causes
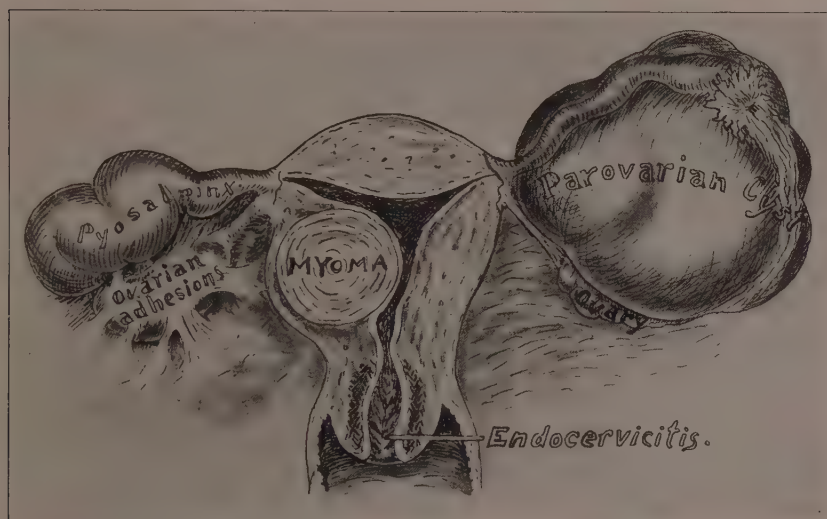
Fig. 177.—Diagram showing more common causes of sterility.

of abortion in their victims. Frequent or prolonged exposure to the **x-rays** seems to cause sterility in both sexes.

The possibility of a certain intangible **personal incompatibility** between man and woman causing sterility has been often asserted and certain historical instances have been cited in proof. The cases of Augustus and Livia, and of Napoleon and Josephine may be mentioned. It is probable that a more material reason, perhaps the vagaries of the gonococcus, is the true one.

Local causes, such as faulty development or disease of the genital organs, are the most frequent in sterility. In the chapter on Mal-

formations of the Genital Organs, *defective development* has been considered.

Infection of the pelvic organs or of the pelvic peritoneum may lead to arrest of function as the result of changes in the ovary. The tunica albuginea may become thickened, or the ovary itself become embedded in a mass of adhesions in such a manner as to prevent rupture of the ripened follicle and extrusion of the ovum. Adhesions may prevent entrance of the ovum into the tubes or closure of the tubes may prevent upward migration of spermatozoa. An abscess, hematoma, cyst, or malignant tumor may destroy the ovarian function.

One of the commonest causes of sterility is infection which has involved the *tubes*. They may be bound down or distorted by adhesions. Vitiated secretions of the mucous membrane may be inimical to ova or spermatozoa. Inflammation may destroy the cilia so that motion of the ovum is impaired. When these inflammatory conditions of the tube become partially healed, the ovum may become impregnated and may embed in the mucosa of the tube so as to cause ectopic gestation.

Chronic endocervicitis, by reason of the catarrhal discharge, may cause occlusion of the canal or imprisonment of the spermatozoa. The discharge of *endometritis* may destroy ova or spermatozoa, or the condition of the endometrium may be such that the fertilized ovum can find no suitable lodgment. There is a tendency in chronic endometritis for the ovum to become embedded low in the uterus. The consequent placenta previa is a frequent cause of abortion.

A large proportion of cases of infection of the genital organs and of the pelvis are caused by the gonococcus. Another large number of cases of infection are caused by septic and saprophytic germs which gain access to the tissues during abortion, labor or the puerperium. Probably the majority of cases of sterility in woman are due to infection of some kind. In some cases the infection with the gonococcus or the septic germ occurs at the time of conception. In some the septic infection occurs in connection with the first gestation. In both instances the "one-child sterility" may result.

Displacements of the uterus are often observed in women who are sterile. In well marked anteflexion and retroflexion the cause of sterility is probably the general maldevelopment of the uterus

rather than any actual occlusion of the canal. In retroversions, the sterility is probably due to the associated adhesions which bind the uterus in the abnormal position or to the prolapse which is often co-incident. Interference with circulation in the pelvic vessels causes congestion of the endometrium. The consequent catarrhal discharge, which usually accompanies the displacement, is probably the main factor in the etiology of the sterility.

Cervical **lacerations** seldom interfere with conception or the course of pregnancy unless very extensive. In that case the un-healthy condition of the endometrium is the cause of early abortion and therefore of relative sterility. Lacerations of the perineum may so shorten the vaginal canal that semen can not be retained suffi-ciently long to insure conception.

Uterine tumors are not necessarily followed by sterility. Cancer of the body is rarely associated with pregnancy, probably because it usually exists after the climacteric. Cancer of the cervix is not unusual with pregnancy, and seems to be a small bar to conception.

Fibromyoma is often considered an important cause of sterility; yet, with the exception of submucous growths, and fibroids so large as to mechanically prevent conception, it is doubtful if fibromyoma is a factor of much importance. Fibroids occur oftenest in nulliparæ. Perhaps poor development of the muscle fibers of the uterus is the cause of the fibroids, and not the fibroids the cause of the sterility. When conception occurs with these tumors, abortion is likely to fol-low because of distortion of the uterus, and because of the abnormal condition of the endometrium usually present.

Prognosis

The prognosis of sterility depends upon the cause. Absence or serious underdevelopment of any of the essential organs of genera-tion means an incurable sterility. When the condition is due to the results of tubal disease, the prospect of cure is remote. In cases of uterine displacement, endometritis, lacerations of cervix or perineum, small fibroids, or constitutional disturbances, the prognosis may be good.

Treatment

The treatment of sterility is based upon finding and removing the causes, for there are usually more than one. Persistent treatment is

often rewarded with complete success, when the causal factors are within the bounds of curability.

General treatment must be employed depending upon the general constitutional disorder. Against anemia and debility, proper nutritious diet, moderate and well regulated exercise, fresh air, proper rest, and freedom from excitement should be obtained. Iron alone, or combined with arsenic and strychnine, is often useful. Obesity should be treated in the proper manner with restricted diet, laxatives, and exercise. Frequent miscarriages suggest syphilis, which should be treated in the approved manner, and for the proper length of time.

Local causes which interfere with coitus, such as urethral caruncles, vulvar vegetations, and local hyperesthesias must be eradicated. For many of the lesser forms of uterine underdevelopment, dilatation of the cervical and uterine canals will often prove useful, especially if done just before the menstrual periods and persisted in for a reasonable time.

Lacerations of perineum and cervix should be repaired. Displacements and prolapse of the uterus should be corrected. Infections and the remoter results of former infections should be treated by tampons, douches, or such operations as may be indicated.

Acid discharges often cause sterility by killing the spermatozoa. Therefore, when the discharge from the vagina is found highly acid, alkaline douches should be used, preferably soon before coitus. Weak solutions of carbonate of soda or of borax are useful.

In some cases of retroversion, of laceration of the cervix or perineum, of very short vagina, of interference with intromission because of mutual obesity, or of premature ejaculation of semen, injection of the semen artificially, by means of a long syringe, into the uterine canal, may prove beneficial. This method is called *stirpiculture*.

CHAPTER XIX

NEUROSES AND PSYCHOSES

Neurasthenia, hysteria, and mental derangements occur in women suffering from disorders of the genitals, modify the symptoms of these disorders, and are modified by them. Even the normal functions of the genitals, such as ovulation, menstruation, coitus, and pregnancy, are changed and vitiated by these neuroses and psychoses so as to appear pathological. On the other hand, disorders of the genitals contribute to nervous exhaustion, and aid in determining the outbreak of psychic disorders.

In spite of the close relations between abnormalities of the female genital organs and those of the nervous system, such conditions as sexual neurasthenia, ovarian neuralgia, menstrual hysteria, gestational melancholia, or puerperal insanity, do not exist. These terms are often used to express the close relationship between genital and nervous disorders, but must not be considered as denoting actual pathological entities. Various types of mental and nervous disorders may affect the pregnant woman, the puerperal woman, the menstruating woman, the climacteric woman, or the woman suffering from pelvic disease, just as they may affect other women or men.

Just as most cases of neurosis and psychosis have exciting causes of the outbreak, so those accompanying gestation and pelvic disease may be excited by the extensive bodily changes incident to these conditions. In the normal menstruating or pregnant woman we note certain marked eccentricities and nervous phenomena which only become pathological when extreme. Some degree of nervous or mental instability must preexist if the eccentricities are to be exaggerated into neuroses or insanity. The element of heredity can be traced in the great majority of instances.

NEURALGIA

Neuralgic pain referred to the different pelvic organs or to different localities in the pelvis is not uncommon.

So-called *ovarian neuralgia means* pain referred to the pelvis or lower abdomen. It may often be localized in the nerves of one or both ovaries. On the other hand, it may arise from stimuli of various other nerves of the pelvis.

Pelvic neuralgia may be toxic or due to pressure.

Toxic neuralgia of pelvic organs may arise from various kinds of poisons. Seats of infection anywhere in the body, especially in the pelvis, may cause pain in the nerves of the ovaries or other pelvic organs. Chronic alcoholic poisoning may have similar effects. Any tendency to pain of this character is intensified by the congestion due to menstruation.

Pressure neuralgia, in the pelvis as elsewhere, may be due to compression of nerves by tumors, displaced organs, or inflammatory exudates. In case of a large tumor or other mass pressing upon the nerves of the sacral plexus, there may be, in addition to neuralgia in the pelvis, pains in different localities in the lower extremities whose nerve supply comes through portions of the plexus thus compressed. Pressure neuralgia is likely to be heightened in the menstrual period.

Neurasthenics, that is, individuals whose nervous system and nerve force have become exhausted by long continued disease or strain of mind or body, and who have lost their will power through permitting their minds to dwell unduly upon the various large and small annoyances and discomforts of life, are more likely than others to suffer from various forms of neuralgia of the pelvis and of the genital organs.

Treatment of these forms of neuralgia should be conducted along the same lines as that of neuralgia in other parts of the body. A local focus of infection should be eliminated if possible. Toxins from faulty digestion should be prevented by diet, laxatives, and care of the alimentary canal. The use of alcohol or other poisons should be stopped. Tumors or compressing masses should be removed by local treatment, by radiotherapy, or by operation.

SEXUAL NEURASTHENIA

Neurasthenia with manifestations marked in the genital system or attended with sexual anomalies is not uncommon. The patients are usually of congenitally nervous temperament, the so-called "high-

strung'' women, always ready to allow their wills to be overcome by their emotions. Many of the symptoms verge upon those of hysteria or even of mental derangement. Heredity is a marked factor in many cases.

The term sexual neurasthenia is not strictly scientific, but is a convenient one under which to group various nervous and mental phenomena having different sexual manifestations. Among sexual manifestations may be included masturbation, nervous dysmenorrhea, sexual perversions, nymphomania, sexual frigidity, and the neuroses of the climacteric.

Masturbation is far more common among girls and women than is generally supposed, probably even more common than among boys and men. The personal consequences of illicit intercourse are much more serious to women and the opportunity of indulgence much less under their control than is the case with men. Masturbation is usually an effect rather than a cause of weakened mentality. It is, in both sexes, one of the commonest symptoms of insanity. On the other hand, there is little doubt that the practice, persisted in to an excessive degree, must be irritating to the genitals themselves and particularly destructive of mental self-discipline, which is already defective in these individuals.

Sexual perversion, such as sexual attraction toward someone of the same sex, abnormal methods of coitus, mutual masturbation, even sexual relations with animals, are not very rare in that class of abnormal women known as sexual neurasthenics. Often sexual neurasthenia will be manifested in a less crude and repulsive manner than above mentioned. Such women will often like to read erotic literature, to see suggestive plays, to talk of sexual matters. They may visit the physician for the purpose of inducing him to make bimanual examinations. One must often be on his guard and should refuse to examine such patients or to give them local gynecological treatments unless the scientific indications in each instance are imperative.

Nymphomania is a rather extreme form of sexual neurasthenia, characterized by excessive desires and frequent attempts to satisfy them. These attempts to obtain satisfaction often lead the patients very far from the precincts of modesty.

Treatment for the above forms of sexual neurasthenia is seldom

perfectly satisfactory. There is so often a psychic element of grave import in the case, that it borders or encroaches upon insanity. Sometimes the condition is intensified, perhaps sometimes initiated, by local irritation in the genitals. If such a source of irritation can be found, it should be treated surgically or medically. Even in the mental cases, complete cure of local irritations may reduce the severity of the sexual manifestations.

Sexual frigidity, that is, lack of desire for coitus or lack of pleasure during the act, is so common that it can hardly be catalogued as abnormal. Too often the fault lies with the male, who is either too impetuous, too rough, or himself so ardent that the sexual act is completed on his part before desire and pleasure have been awakened in his partner. The sexual act is far more a thing of the heart and soul on the part of the woman than of the man. Personal attraction towards the partner is more necessary for sexual satisfaction of the woman than of the man. In the latter the sexual act is less spiritual, and more physical than in woman.

Successful treatment of sexual frigidity can often be obtained by proper education of the man by the physician. He should be taught to be gentle, deliberate, considerate, and moderate. Always, in either sex, pain during or in consequence of coitus prohibits pleasure. Sometimes pain during coitus is due to some inflammatory or other disorder of the pelvic organs. This is especially noticeable in cases of retroversion with adhesions, metritis, salpingitis and other diseases causing pain and tenderness. Cure of the genital disorder, whatever it may be, often cures the frigidity.

The **neuroses of the climacteric** are usually due to the diminishing supply of hormones from the ovarian internal secretion. Disturbance in internal secretion of one gland usually causes disturbances of the same or opposite character in other internal secretion glands. The character of the blood is changed, and the general nutrition of the body and of its different parts is changed. In consequence, the patient complains of numerous nervous phenomena. She has hot flashes, headaches, disorders of digestion, change in temperament, often melancholy, and a host of other neurotic and psychic symptoms. Similar symptoms are observed when the ovaries have been removed or have lost their functions from disease before the climacteric period.

Treatment must be general and symptomatic. Sources of psychic

irritation must, so far as possible, be eliminated. The general health must be promoted by proper diet, tonics, exercise, fresh air, mental relaxation, change of scene, and such general measures. Ovarian extract or extract of corpus luteum is often a beneficial remedy. The extract of corpus luteum is given in tablets or capsules of five grains each four times a day. A hypodermic solution of the extract in ampules is a useful preparation. Strychnine or nux vomica occasionally is a good adjuvant.

Most of the neuroses of the type under consideration, especially when there there is a minimum of the psychic element present, are often successfully treated by some modification of the Weir-Mitchell *rest cure.* This can rarely be well conducted in the patient's home. Removal from scenes and influences which have probably contributed to her condition is almost always essential.

The rest cure is best undertaken in a sanitarium or hospital, or, best of all, in some institution where this form of treatment is made a specialty. The main principle of treatment is *rest.* The patient is first put to bed and for several days is not allowed to rise for anything. If the digestion will permit, she is fed a considerable amount of highly nutritious food in small quantities at each time.

A secondary principle is *discipline.* Everything should go on with precision; each bath, massage, rest period, meal, face-washing, etc., should be administered without comment, as if it was as inevitable as the sunrise.

After a variable period, according to the individual case, the patient is allowed to begin *exercise,* to rise, to go about her room or the institution, even to take walks or rides out of doors. She is led through each step progressively. The course of treatment in such a sanitarium requires four to six weeks. She goes back to her home, like a graduate of a drug or alcoholic cure, relieved mentally and physically and trained in self-discipline.

INSANITY

Etiology.—A large number of women become insane during sexual life or near the menopause. This statement alone does not imply any etiological relation between insanity and the sexual life, because that period, from fifteen to fifty, embraces more than half of the normal life of woman and man also.

The exciting factors in the outbreak of insanity in men are syphilis, alcoholism, exposure, and irregular living. From these women are more free than men because they usually receive better care. There is a greater proportion of married women insane than married men. Since married women are the least of all liable to the effects of dissipation and irregular living, we must look for some other etiological factors in them.

Such factors are found in the greater susceptibility to neuroses and psychoses in women and the greater liability to diseases of the pelvic organs. Twenty-two per cent of psychoses in women come on at or near the menopause, while the age between 18 and 25 furnishes the greatest number of entrances into asylums.

The relation of diseases of the female genital organs to mental disease has been long recognized, but the intimacy of such relation has been the subject of controversy. Outbreaks of insanity are commonest during menstruation, at the climacteric period, during labor, and in the puerperium.

Women who have pelvic lesions are probably more likely to become insane than are women with normal pelvic organs. Hobbs found twenty-five per cent of all women in his asylum had some form of pelvic disorder. Correction of the genital abnormality by operation or otherwise was followed by improvement and apparent cure in a larger proportion of insane women than had been improved or cured under the usual treatment.

Treatment.—There is little doubt that removal of possible irritating influences from the diseased pelvic organs in an insane woman will cause at least some improvement. It is very rare for gynecological operations to be followed by insane outbreaks. At any rate, even an insane woman is entitled to have her genital disorders treated as much as any other woman.

There must be, in each case, a real gynecological lesion found before operation is attempted. There is no prospect, according to the best of modern authorities, for benefit or cure of insanity by *operations upon normal genital organs.* Formerly many normal ovaries were removed in hope that the mental condition, perhaps in some vague way dependent upon the genital function, could be cured or improved by removal of the essential female sexual organ. There is, however, reason to believe that lack of ovarian hormones is a more frequent cause of mental disturbance in women than is excess.

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